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Feature Story

Intel Vice President and General Manager Pat Gelsinger describes how the latest advances in Visual Computing are driving the evolution of the PC platform. Following Mr. Gelsinger's update, you'll find in-depth information in our "Focus" section on how Intel is working with the industry to deliver the building blocks that are making the Visual Connected PC platform a reality today.

Top News Stories

Announcing the Intel Developer Forum: "Beyond the Spec"

Intel announces its premier hardware developer event, coming on September 29, to help you implement the latest platform technologies.

Leading the Way to PC 98

Release 1.0 of the PC 98 System Design Guide is now available. See how Intel's role helped shape this guide to building next year's PC platform.

The Arrival of the Network PC (Net PC):

"Cutting Costs without Compromising Performance"

Intel's Vice President of Business Client Marketing provides a glimpse of how the Net PCs available this year can help businesses reduce costs without losing their performance edge.

USB: At the Core of a New PC Usage Model

This Q&A with Intel's USB gurus helps answer all your questions about how new USB products arriving on the market today are changing the PC usage model.

Platform News and Information

***** Check out our Platforms, Technologies, and Events pages *****

Every month we cover the latest developments in platform initiatives and technologies. Our "Platforms" pages provide news on the latest trends and initiatives for the business, home, mobile, server and workstation platforms. Our "Technologies" pages give you quick and detailed information on the industry status of specific platform technologies, from the emergence of the Accelerated Graphics Port (AGP) to the latest advances in Intel microprocessors, memory, Audio, USB, 1394, DVD, Power Management, and PC 98. Our "Industry Events" page keeps you up to date on upcoming industry gatherings targeted at the platform and peripheral developer, including the new Intel Developer Forum.

Technology News

This department is your source for the hottest technology and product announcements, white papers, design guides, specifications, tools and developer events available to the industry.

PC 98 System Design Guide Release 1.0 Now Available

<http://developer.intel.com/design/pc98/index.htm>

Business Platforms Benefit from MMX™ Technology

<http://www.intel.com/businesscomputing/techlead.htm>

New Wired for Management Tools Now Available

<http://developer.intel.com/ial/dmi/>

AGP Platform Design Guide Now Available

<http://developer.intel.com/technology/agp/desguide/index.htm>

Intel Announces availability of the First AGP Chip Set

<http://www.intel.com/pressroom/archive/releases/CS082597.HTM>

Wired for Management and Net PC Interoperability Plugfest Coming Soon

<http://developer.intel.com/solutions/events/industry/>

Portable PC Camera '98 Design Guide Now Available

<http://www.intel.com/imaging/trends/guidelin.htm>

DVD is Coming to a PC Near You

<http://developer.intel.com/solutions/tech/dvd.htm>

USB Digital Audio White Paper Available

<http://developer.intel.com/design/usb/applnots/292206.htm>

USB Mobile System Design Guidelines Now Available

<http://developer.intel.com/design/usb/designex/usbgl10.htm>

Reader Services

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<http://developer.intel.com/solutions/>

We want you to consider *Platform Solutions* as your personal information resource for the Intel architecture platform. If you can help us make it better, or if you have a comment, question or a specific topic you would like to see covered, we want to hear from you. Please take the opportunity to send us an email with your specific feedback or request to:

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***On behalf of all of us at Platform Solutions,
welcome to the future of the PC platform!***

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Feature:

Making Visual Computing a Reality

by Pat Gelsinger
Vice President and General Manager
Intel Corporation, Desktop Products Group

Intel first introduced the concepts of Visual Computing at Fall Comdex in 1996. Since then Intel and the industry have embraced the concepts of visual computing and have made extraordinary progress towards delivering visual computing on millions of modern PCs in the next year. Today, we would like to update you on the progress that has been made as well as supply some additional technical details and resources. But, first let me revisit the basic concepts of visual computing.

Visual computing describes the ability of the personal computer to deliver a life-like, visual interactive experience to the PC user. Visual computing is the next step in the continuing evolution of the PC. It will enable consumers to have a richer, more interactive gaming experience or Internet session, while at the same time, deliver workstation class performance on graphics and 3D for the business user. Visual computing also enhances the ability of consumers and businesses to interact and conduct business "screen to screen" over the Internet.

With the introduction of the Pentium® II processor, Intel is playing a major role in enabling visual computing on the PC platform. Visual computing takes advantage of several of the platform innovations that are being delivered with the Pentium II processor such as the increased system bandwidth of the Dual Independent Bus (DIB) architecture, also known as Slot 1, as well as the recently announced Accelerated Graphics Port (AGP) support. The combination of the Pentium II processor, AGP and DIB architecture enables the high performance 3D and graphics at the foundation of visual computing.

There are several other platform level innovations that Intel and the industry are working on to deliver visual computing experiences to PC users. The "Focus" article on Visual Computing in this newsletter will highlight several of those. You can also attend the first Intel Developer Forum taking place this month to gain access to Intel's top architects and their implementation knowledge of visual computing technologies. Intel is undertaking these technical activities and making this information available to make certain the industry can deliver on the promise of interactive, life-like experiences to PC users.

Thank you for visiting our new Platform Solutions newsletter - I hope you will find it informative and meeting your needs.

About the Author: *Pat Gelsinger is Vice President and General Manager of Intel's Desktop Products Group. As head of DPG, Pat is responsible for all of Intel's desktop products, platforms and technologies.*

For more information on Visual Computing and the visual connected PC, please visit the "Focus" area (<http://developer.intel.com/solutions/focus.htm>) in this issue of Platform Solutions.

For the latest news and information on other Intel platform initiatives and technology ingredients that support visual computing, please visit Platforms and Technologies sections.

For registration information and details of the first Intel Developer Forum taking place on September 29, please go to the IDF web site at (<http://www.intel.com/intel/idf/>).

Top Stories:

Announcing the Intel Developer Forum: "Beyond the Spec"

by Dan Russell
Director of Platform Marketing
Intel Corporation, Desktop Products Group

Never before have PCs been so technologically sophisticated, user-friendly, useful and versatile. Yet developers of personal computers and related products currently face tougher challenges today than at any time in the history of the PC industry. We have educated our customers to demand more from us, and to demand it faster than ever before. PC technology is evolving rapidly and is growing more complex, which makes it ever more difficult to meet both time-to-market schedules and the expectations of customers who demand perfect PC experiences.

Whether the product is a Network PC (Net PC), a new Accelerated Graphics Port-enabled system or a Universal Serial Bus-compliant peripheral device, developers can feel like early pioneers: we get to explore new territory, but it's easy to get shot full of arrows in the process. Before you circle the wagons, I'd like to introduce a new concept from Intel intended to make the product developer's life easier.

The Intel Developer Forum (IDF) is a new source of tools and training for advanced PC platform and peripheral developers. IDF will offer multiple days of highly focused, in-depth technical presentations, demonstrations and dialogue by Intel's lead architects on the latest platform technologies and initiatives. IDF will give developers direct access to Intel's unique repository of practical information that you can use to implement testable platforms, products and applications. IDF takes you 'beyond the spec,' focusing on implementation issues and providing tools and information you need to avoid development pitfalls and minimize time to market for the newest PC platform technologies.

"Beyond the Spec"

As every developer knows, there is a product development "stack" which starts at the bottom with a baseline technology specification and ranges upward through design guidelines, and on to the volume implementation of testable platforms, development tools and services, peripheral products and application content. At the very top of the stack is a phenomenon called "user acceptance" which is usually identified with a product that works and provides a satisfying user experience. Developers quickly realize that until the entire capability stack is in place--until all the information holes are filled--market channel awareness and acceptance of the new technology remains low, because users do not receive the full benefits of the technology.

In the course of Intel's own research and product development, we have amassed a great deal of technical "know how" that could be of enormous practical value to developers. Until now, most of this information has largely remained inside the company and has been unavailable to developers. The Intel Developer Forum offers a way to take the practical experience Intel has accumulated during the development of processors, chipsets and motherboards and make it available to "fill in the holes" between baseline specifications and the practical implementation of systems, peripheral products, tools and applications. Our goal with IDF is to reduce much of the uncertainty associated with developing PCs and hardware products based on new technological standards.

Intel Developer Forum at a Glance

The first Intel Developer Forum is a 3 day event scheduled for Sept. 29 - Oct. 1, 1997 in San Francisco, CA, USA. Here's a quick glance at what you can expect as an attendee.

- * Ten hot technology tracks with more than 50 technical sessions.
- * Implementation design guides, SDKs, PDKs, specifications, whitepapers and performance optimization tools.
- * Real-world technology implementation demos.
- * One-on-one access to Intel architecture experts.
- * Opportunities to network with your peers.

As a special guest, Gordon Moore, Chairman Emeritus and co-founder of Intel Corporation, will give a keynote presentation on the now-legendary "Moore's Law".

Here's a quick description of the ten technology tracks offered at the September 29 IDF.

Wired for Management:

This two-day track covers the tools and techniques for designing and building Wired for Management Baseline (WfM) platforms, and features instruction for integrating the appropriate building blocks needed to ship interoperable systems that adhere to the specification. Attendees will receive Release 1.5 of the Wired for Management Toolkit which includes the latest Intel development tools and a "how-to" system design guide for building a manageable platform.

Host-Based Interactive DVD:

Gain an insight into the exciting new technology of Host-based Interactive DVD, the first step in the era of digital convergence. This track will provide the implementation details to include this new multimedia capability on mainstream PCs. Platform Implementation Design Guides and whitepapers will be provided.

Optimizing CPU Performance:

Intel uses specific design methodologies to develop platform technologies that deliver next generation processor performance at mainstream price points. This track describes these design techniques and provides Pentium® II processor-based design examples. This information will provide an in-depth understanding of the rigor behind Intel's design guidelines and highlight how they can be used to speed product development.

Optimizing Memory Performance:

PC main memory bandwidth requirements keep increasing, driven by new PC platform applications and richer data types like 3D graphics and video and platform ingredients like faster processors, the Accelerated Graphics Port, and faster serial buses. This session will explain the 66 and 100 MHz SDRAM specifications and provide PC system design guidelines and trade-offs for the use in future system designs.

Desktop Graphics and I/O Technologies:

As performance of new processors keeps improving to provide new PC capabilities like 3D graphics and video processing, the requirement for faster graphics and storage subsystems keeps increasing as well. Intel is working with the industry to bring the new serial bus standard, 1394, to PC platforms bringing high I/O bandwidth for storage devices. Intel has developed the Intel Performance Evaluation and Analysis Kit (IPEAK) to help IHVs and OEMs shorten their time-to-market, and design and select higher performance graphics (AGP, 3D) and I/O products. IPEAK is a new family of platform performance evaluation and analysis tools currently including tools for graphics, storage and power management.

Power Managing the Desktop PC:

The Desktop Power Management track will describe Intel's vision and implementation for the Instantly Available power-managed PC. As the desktop PC transitions to a consumer electronics device in the living room and we realize the environmental impact of electricity required for PCs, the need for fully power-managed desktop PCs becomes more evident. This track provides details for designing a fully power managed desktop PC, including a tutorial on the Power Management Analysis Tool (PMAT), a new tool that is part of the IPEAK family of performance and evaluation tools (see Desktop Graphics and I/O track above). This track will also benefit mobile developers by providing general power management information.

Designing PC Theater Products:

As PCs migrate into the family room, hardware and software developers face unique challenges to deliver products that meet the requirements of this emerging market segment. Attendees will understand design issues and technology integration challenges for designing PC Theater products. Design guides and technology demonstrations will be provided to complement the information from Intel's architects and design engineers.

Mobile Platform Design Techniques:

This track offers the key technical tools and information to implement Mobile platforms, including techniques for optimally power managing USB and AGP. It also features demonstrations of the mobile manageability SDK and a useful new power measurement tool. Attendees will receive the latest Mobile design techniques collateral.

Server Platform Design Techniques:

This track will share the practice and experience of leading Intel engineers who have defined, implemented, and optimized around today's key server standards. The Windows NT* hardware design guide will be provided.

PC 98 - Beyond the Design Guide:

This track reveals the reality of price/performance and schedule of PC platform designs. Using the PC 98 System Design Guide, co-authored with Microsoft* Corporation, as a base, this track looks at the key tradeoffs for each of the defined system types and makes product recommendations for mid-1998 and early-1999 introductions. Design examples of each system type will be presented.

Intel's Commitment to Developers

Intel is making a commitment to the PC industry to help identify the technology initiatives which will drive the evolution of the PC platform. We will continue our involvement with industry groups to provide input to the specifications. With the Intel Developer Forum we are furthering our commitment to developers by providing valuable tools which focus on implementing these specifications.

About the Author: *Dan Russell is Director of Platform Marketing at Intel Corporation. He is responsible for PC platform strategy and initiatives for Intel's Desktop Products Group.*

Registration and Event Details

For registration information and more details on the September IDF training tracks and presenters, please visit the Intel Developer Forum web site at (<http://www.intel.com/intel/idf>).

Leading the Way to PC 98

by Jim Pappas

Director of Platform Technology

Intel Corporation, Desktop Products Group

The PC platform is undergoing rapid growth coupled with a major transformation and its future promises to be even more exciting than its past. The basic ergonomics of a PC - large box with CRT on top and a keyboard in front - has remained remarkably constant since this form factor was introduced as the "IBM PC" in 1981. But today, the PC is maturing from the universally-adaptable, "one-size-fits-all" paradigm into purpose-built appliances designed for specific target market segments.

Inside "the box" the PC platform has undergone significant evolution moving from processor generation to processor generation. Today's microprocessor, the Pentium® II processor, is 1000 times more powerful than the IBM PC's original 8088 processor. The data bandwidths required to support today's applications and peripherals, such as encoded video with content protection, 3D rendering with textures and secure intranet traffic have also increased dramatically and careful system design is required to ensure that these multiple data streams do not interfere with each other. This growth is requiring more intense interaction between the hardware and software sub-systems.

Unconstrained growth could create compatibility, configuration, management and migration problems so the approach that Intel is taking is a focus on the essential new ingredients required to foster innovation. Intel's high-level, leadership role advocates and drives for open specifications and industry cooperation providing reference designs and documentation as required. The multiple, diverse direction that the PC platform is advancing along demands that we build new expertise in new industries.

In order to best manage and direct this diversity, Intel is working with Microsoft Corporation to co-author the PC 98 System Design Guide. Intel has been a major "behind-the-scenes," technical contributor to the previous versions of the PC 9x series and it is a natural evolution to be co-author this year. With the increasing performance of the processor, previous tasks that required dedicated hardware can now be implemented in software - this decreases the overall system cost but demands greater cooperation between the hardware and operating system especially within device drivers. By working together, Intel and Microsoft can ensure that the hardware and software development is overlapped and solutions are available for PC 98 system deployment.

Focused work on PC 98 began early this year. Intel assembled a large team of experts for each major topic area and each technology initiative. Intel was already active in many areas complementary to the basic PC platform, so finding chapter owners was straightforward. Each chapter had two owners - one from Intel and one from Microsoft - who were responsible for soliciting input and managing the feedback and interactions with their chapter. Each company chose an Editor-in-Chief to manage the process and identify and work intra-chapter issues. Intel created an intranet site so that the latest chapters, current issues and industry review feedback could be viewed by the whole PC 98 team. This site raised the overall quality of the document since all chapter owners could review and contribute to the complete document.

Regular team meetings, interspersed with intense research, produced a draft for industry review in early April. The ample feedback was very consistent: it pointed to key sections which were confusing or needed more explanation but did not identify major areas of disagreement. We felt comfortable, therefore, moving directly to Version 0.9 in late June. The intensity and quality of the industry review increased during the next phase where the remaining issues were addressed. The volume of industry comments prevented individual replies but all input was considered by the chapter owners who rapidly converged on Version 1.0. This was uploaded to both companies web sites in mid-August.

The PC 98 System Design Guide follows the same format as previous PC 9x design guides: it is divided into four sections covering introduction, system types, expansion buses and add-in/add-on adapter design. The introductory section covers general industry trends and highlights some upcoming technologies such as OnNow and ACPI, manageability initiatives and Device Bay.

Part 2 covers the System Types defined in PC 98. There was concern that the number of system types would explode from the initial three defined in PC 97 (basic, workstation and entertainment). Defining a large number of fixed-configuration system types would constrain innovation and make compatibility more difficult. The essential driving elements were distilled out and most of our energy went into defining a robust Basic PC 98. Enough flexibility was written into the document such that a SOHO (Small Office Home Office) system, basic home PC and a basic office PC could be configured, using optional add-in/add-on features, from this Basic PC 98 model. The Network PC (Net PC) (<http://www.intel.com/businesscomputing/netpc/>) is considered a derivative of the office PC and does not have a separate category.

A separate chapter was added for a mobile PC since its design constraints follow different goals: portability and battery life force different system optimizations. Compatibility, especially in the case of a docked mobile PC, is referenced back to the basic PC for platform consistency.

The over-riding benefit of the basic PC definition is a known environment for the Windows operating system to excel in. Software features may be added knowing that the underlying, enabling hardware will be present.

The workstation system type was retained despite its large overlap with the office PC definition. I would expect this category to disappear in the next major version of PC 9X.

The entertainment PC system type pushes the envelope on new technology introductions. The audio and video world are rapidly migrating into the digital domain and this, coupled with the recent acceleration of realistic 3D graphics into the PC platform, is targeting the entertainment PC as THE BEST user entertainment experience. While some fixed-function broadcast receivers, DVD players and audio decoders exist today, the flexibility of a programmable, richer human interface which integrates all of these functions and more, to create an even better, more cost-effective, product will drive this market segment.

Part 3 of the PC 98 System Design Guide covers expansion buses for the system types. These topics have been updated and expanded from earlier PC 9X versions, but no new buses or initiatives have been introduced.

Part 4 focuses on add-in/add-on adapter design. Major innovations, when compared with PC 97, are covered in the Graphics chapter, Video and Broadcast chapter and the Audio chapter. Much of the "how to" text from previous PC 9x design guides has been replaced with "meeting this requirement" text – this shift is designed to encourage innovation since there are often multiple hardware solutions to individual technology problems. This increased scope will allow increased differentiation from the engineering community and will foster improved designs.

In summary, the PC 98 System Design Guide has been written to promote innovation and address the expanding role of the PC platform while resisting the possible fragmentation which could result within a rapid growth phase. Intel was able to consolidate a large amount of platform R&D and expertise into this single reference document; a wealth of additional design information is also available from Intel's developer web site (<http://developer.intel.com>). Intel is also making available more detailed design information and training, as well as access to its lead architects, at the newly announced Intel Developer Forum coming on September 29. A special day-long PC 98 track has been developed that looks at the key tradeoffs for each of the defined PC 98 system types and makes recommendations for product introductions. Design examples of each system type will be presented.

Much of Intel's efforts are involved in driving and building upon open specifications for the PC industry. The future of the PC platform can be summed up in three words: growth, growth and growth. We can manage and direct this diversity to create a future PC industry that is even brighter than its excellent past.

About the Author: *Jim Pappas is Director of Platform Technology at Intel's Desktop Products Group. Jim manages Intel's PC 98 activities and the interface between Intel Corp. and Microsoft Corp.*

To Download the latest version of the PC 98 System Design Guide please go to:
<http://developer.intel.com/design/PC98/index.htm>

For details and registration for the "PC 98 - Beyond The Design Guide" training track, please visit the Intel Developer Forum web site at <http://www.intel.com/intel/idf/>

The Arrival of the Network PC (Net PC): "Cutting Costs without Compromising Performance"

by William A. Swope
Vice President Business Desktop Marketing
Intel Corporation, Desktop Products Group

The communications revolution of the 1990s has given rise to an entirely new dimension of computing. Whereas computers were once defined by the data they processed, today they are defined by connectivity, or by what and how they connect to information, and for what purpose. Businesses have embraced the very notion of the connected PC as necessary to achieving strategic goals.

The technologies supporting the connected PC -- expanded PC capability, proliferation of hardware and software choices, and accessibility of the Internet -- have made the corporate computing environment increasingly complex and expensive to manage. Intel is helping to guide the computing industry towards delivering manageable platforms and management capabilities. These will reduce the complexity and expense associated with deploying and managing corporate networks.

Wired for Management Initiative

Intel's Wired for Management (WfM) initiative is part of a broad-based industry effort to make all PCs and servers easier to manage. WfM-capable systems and tools will dramatically reduce total cost of computing ownership. The initiative includes new Intel hardware and software products, alliances with other industry leaders, education and development programs, and Intel-led industry efforts to develop manageability standards. The WfM initiative targets reductions in the most expensive element of business computing: support.

The WfM baseline specification, a key deliverable of the WfM initiative, establishes a minimum set of management interfaces that enable such capabilities as remote configuration and installation of operating systems and software applications, remote control and diagnostics, and after-hours maintenance. Four core technologies specified by the **WfM baseline** that together help make it possible to reduce the total cost of ownership (TCO) of business computing are **instrumentation, service boot, remote wake-up, and power management**. Beginning with this baseline, PC OEMs can build further capabilities to deliver more easily manageable systems, which brings added value to their customers.

By deploying systems that conform to the WfM Baseline Specification, in conjunction with Operating systems and applications written to take advantage of these new capabilities, an IT group can create a more flexible workplace with better asset management, user support, and network services. Microsoft's Zero Administration for Windows* (ZAW) is an example of a complementary initiative designed to create more manageable Windows* operating systems and applications which will fully utilize the WfM baseline capabilities. This standardization is a major step in reducing TCO.

(For more information on the Managed PC and the Wired for Management baseline specification, please visit Intel's web site at <http://www.intel.com/managedpc>).

(For more information on Microsoft's ZAW, please visit their web site at <http://www.microsoft.com/windows/zaw/>)

Network PCs (Net PCs)

The Network PC, or Net PC, was born out of Intel's WfM initiative to reduce TCO without sacrificing necessary performance or PC compatibility. The Net PC is a new category of business PCs designed from the ground up to be centrally managed, while simultaneously delivering the power and versatility of a traditional business desktop computer. The Net PC not only embodies Intel's Wired for Management goal of reducing TCO, but also spurs the adoption of management technologies in business PCs at all levels.

Reducing TCO without Sacrificing Performance and Versatility

The standard configurations associated with Net PCs reduce the complexity of multi-client PC environments by greatly simplifying tasks associated with deploying new systems, asset management, and maintaining consistency across departments. Performance is optimized because the Net PC is comprised of the latest PC technology - Pentium® II processors, smart hard drives, DIMM memory, and manageability tools such as Intel's LANDesk® products.

In addition, the "sealed" chassis design of the Net PC allows a range of performance and upgrade options without incurring the costs associated with managing a myriad of complex configurations. By locking systems to end-users, IT can offer its users the performance and flexibility they require, but in an authorized, planned and, hence, lower total cost manner.

Built-in Compatibility

As a member of the Intel Architecture based PC family, the Net PC brings with it the compatibility benefits of Intel architecture and Windows*-based systems that allow organizations to preserve and build upon their existing PC-based LAN environments.

The Net PC is ideal for:

- a centrally-managed PC environment
- data- and task-focused users who do not require hardware expandability – e.g. functions such as customer support, manufacturing, finance and training
- kiosk-oriented information delivery

Net PCs are based on a reference design guideline developed by Intel, Microsoft*, Compaq*, Dell* and Hewlett-Packard*. To download the Net PC system design guideline or get more Net PC information, please visit the Net PC web site at <http://www.intel.com/businesscomputing/netpc/>

Growing Momentum

Intel's announcement of the WfM initiative in September of 1996 generated considerable enthusiasm for managed PCs from OEMs, independent workgroup and enterprise management software vendors, as well as end-users. Intel has followed up the initial announcement with a series of tools and events delivered to the industry in 1997 to further enable manageability in desktop PCs, notebooks, and servers.

- LANDesk® Configuration Manager 1.0: Intel product released in March provides the ability to manage and control configurations of desktop PCs. For more information please visit <http://www.intel.com/network/config/index.htm>.
- Wired for Management Baseline 1.0: The April publication of this baseline specification established a framework for PC manufacturers enabling them to produce systems that can be effectively managed over corporate networks in order to reduce customer support costs. To download the specification please visit <http://www.intel.com/managedpc/wired/wired.htm>.
- Network PC System Design Guidelines: Also published in April, these guidelines comprise a reference document for designing Net PC Systems for use with the Microsoft Windows* and Windows NT* Operating systems. Net PCs are based on a reference design guideline developed by Intel, Microsoft*, Compaq*, Dell* and Hewlett-Packard*. To get the guideline please see Intel's NetPC web site at <http://www.intel.com/businesscomputing/netpc/>
- Net PC Trials: In April, Intel asked several Fortune 500 companies to evaluate a pilot version of a Net PC. Each site deployed Net PCs, as well as a dedicated management server and the Intel LANDesk Configuration Manager. To see case study results please visit <http://www.intel.com/businesscomputing/netpc/>
- Net PC Interoperability event: In June, 14 PC OEMs attended this Intel-hosted event to test the interoperability of their Net PCs with management applications. The manufacturers were

also able to evaluate the compliance of their designs with the Net PC Systems Design Guideline reference.

- **Net PC Product Announcements:** On June 16, leading PC OEMs joined Intel at PC Expo in New York to formally unveil the Net PC. Twelve PC manufacturers announced Net PCs for shipment in the third quarter of 1997 with a wide range of performance capabilities from Intel processor-based designs. For a list of OEMs who announced products, please see the press release at <http://www.intel.com/pressroom/archive/releases/WM061697.htm>
- **Wired for Management Baseline 1.1:** Published in June, Intel expanded the WfM baseline specification 1.0 to include mobile PC and server technologies. For more information, please see the mobile manageability web site at <http://www.intel.com/mobile/entrprse/managepc/> and the server manageability press release at <http://www.intel.com/pressroom/archive/releases/wm063097.htm>. To download WfM baseline 1.1 please go to <http://www.intel.com/managedpc/wired/wired.htm>
- **Wired for Management tool kit** - Available in July, the kit includes all the relevant content product developers need to design and build Wired for Management baseline platforms, as well as providing opportunities for OEMs to differentiate their products above baseline capabilities. To get the WfM toolkit, please visit <http://developer.intel.com/ial/dmi/>

What's Next for Manageability

As the Wired for Management initiative continues to gain market momentum, Intel will continue to help guide developers in their implementation of baseline specifications. Intel is sponsoring the second WfM Interoperability Event for PC system vendors in September 1997. The primary purpose of this event is to deliver the benefits of desktop and laptop PC manageability offered by the WfM Baseline Guidelines 1.1 to a global collection of PC companies. This will also be the first common gathering of enterprise and workgroup management software vendors who support Wired for Management.

In addition, the first Intel Developer Forum (IDF) on September 29, 1997 will provide a WfM training track for advanced hardware development. IDF will feature three days of in-depth technical sessions and demonstrations presented by Intel's lead Net PC system architects, with a particular focus on the latest Intel technologies and initiatives driving manageability.

(For more detailed information on these events, please visit the Platform Solutions "Industry Events" page at <http://developer.intel.com/solutions/events/industry/>).

Intel is committed to delivering platform innovations and compelling management capabilities to reduce the complexity and expense of corporate networks. With the emergence of the Net PC, Intel expects to speed the adoption of advanced management technologies without compromising performance, functionality or existing IT infrastructures. Growing on the momentum of Wired for Management and the Net PC, Intel will continue to work with industry leaders to provide a roadmap for future management technologies.

About the Author: *Will Swope is a Vice President of Intel's Desktop Products Group. As head of Business Desktop Marketing, Will is responsible for marketing Intel's complete line of business client products.*

USB: At the Core of a New PC Usage Model Q&A with Steve Whalley and Bala Cadambi

Steve Whalley is the Connectivity Initiatives Manager in Intel's Desktop Products Group and is Chairman of the USB Implementers Forum

Bala Cadambi is Engineering Manager of Peripherals & Interconnect Technology at the Intel Architecture Labs. Bala was instrumental in the establishment of the USB architecture.

Universal Serial Bus has been described as an "industry-led" initiative. Why was it developed?

Whalley--The USB specification was developed by a group of seven leading companies in the Computer and Telecom industries who saw the need for a higher bandwidth, more intelligent serial interconnect. At the same time, these companies wanted to provide an easier way of attaching peripherals without the need to open the box, add custom I/O cards, reboot, set IRQs, etc. Intel was joined by Compaq*, Digital*, IBM*, Microsoft*, NEC* and Northern Telecom* in the development and promotion of the original USB specification.

USB is designed to overcome two historical limitations with the PC. The first is the incremental growth of different interfaces for each device. We began to see PS/2 and joystick interfaces, audio and telephony connections and add-in cards, each with their own set of connectors. To compound the problem, there was no provision for device sharing. Secondly, at Intel we saw the emergence of real-time and multimedia applications, central to the Visual Connected PC, which had the potential to redefine the conventional usage model of the PC. (For more information on Visual Computing and the Visual Connected PC, please visit the Focus section of Platform Solutions at <http://developer.intel.com/solutions/focus.htm>)

You have said USB is "at the core" of this new PC usage model. How?

Whalley--USB is a necessary ingredient to enable new PC application areas like PC Imaging and Computer Telephony Integration (CTI) to reach the mass market. By allowing enhanced transfer rates up to 10 Mb/sec, USB performance enhancements should allow quality audio and high speed data to be shifted to-and-from the PC easily and cost effectively. The ease of use of USB is also a key to end-user acceptance. Together with advances in TAPI, you should begin to see USB-based CTI gain popularity.

In addition, PC Imaging applications like video conferencing and digital imaging are necessary elements of the Visual Connected PC. The performance required for this industry initiative can now be attained without the need for costly add-in card solutions. In addition, the absence of cards and the ease of device sharing should make the PC more manageable. USB is essentially designed to reduce the overall system cost and increase user satisfaction, which are considered to be key ingredients for consumer acceptance.

Consumer awareness of USB is still relatively low. Why should we be in a rush to implement it?

Whalley--While we have intentionally focused our attention on developers, to this point, USB is now routinely listed as a "must have" feature by product reviewers. The first wave of USB peripheral products are now starting to appear, and we are planning to help ensure that end users are informed about the value of USB. Hopefully by the end of this year, USB will be a household name as well as an item consumers will find on retail shelves.

Almost every new PC shipping in 1997 is arriving with one or more USB ports fully enabled. At the same time, Intel is tracking hundreds of peripheral designs implementing the 8x930Ax USB peripheral controller and the 8x930Hx USB Hub peripheral controller. These new USB devices, some of which have already begun to arrive in the retail channel, include monitors, keyboards, digital joysticks, digital cameras, scanners and telephony equipment. By the end of the year holiday buying season, it is expected that a wide range of USB peripheral devices will be available to consumers.

What impact is USB likely to have on PC/electronics sales?

Whalley--With devices such as present day SCSI and parallel port scanners creating double-digit retail return rates, it does not seem unreasonable to assume that end user satisfaction can be incredibly improved by USB--with no add-in cards, software interrupt/DMA set-up and conflict juggling, or other headaches.

Taking the PC and end-user experience to that next level of 'consumer appliance' status should be a win-win for the user, the retailer, the PC OEM and the peripheral supplier. USB also permits flexible new bundling opportunities for PC and electronics resellers, allowing the bundled sale of USB PCs, digital imaging and input devices,. for example, with popular software.

How much does USB add to the cost of a peripheral device?

Whalley--The proper way to phrase this question is 'How much can USB save?' In most applications the added value of USB clearly outweighs any minor incremental costs. This varies depending on the type of device, and whether the traditional non-USB peripheral needs an add-in card or a separate power supply. USB can eliminate both of these add-ons in many cases, resulting in significant cost savings for IHVs and consumers.

Cadambi--With USB taking off as a standard expansion paradigm, the implementation of silicon and cable assemblies is expected to reach cost parity with mature PC interconnects. So clearly, over time, many of the legacy ports and related peripherals should migrate to USB. The PC will benefit enormously from the resultant port consolidation. However, we also expect significant improvements in device functionality to result with this transition.

Whalley--USB is a simple and consumer friendly technology. Intel USB solutions undergo rigorous testing and validation, from the host controller to the peripheral controller, to assure that USB lives up to its ease of use promise. The potential lower customer return rate for USB devices can have a major impact on margins for both OEMs and retailers. Even if the bill of materials is slightly higher with USB, the overall system solution is likely to be lower in the long run.

Will future operating systems provide USB support beyond Windows 95* OSR2.1?

Cadambi -- The PC platform is expected to continue its trend towards higher performance and richer functionality. Delivering a natural end-user experience will be a primary area of improvement. Providing USB capability on every motherboard opens a new dimension. We should expect the operating systems and device drivers to evolve to take advantage of this.

Can you offer some examples?

Cadambi -- Future PCs will offer improved dynamic management of resources like bandwidth and power with systems capable of handling data streams with low latency and synchronization. From an industry perspective, we should start road-mapping device and application development to factor-in this trend. Windows 95 OSR2.1 is a huge step in this direction, providing the core bus driver with external dynamic expansion and isochronous data handling capabilities. Further enhancements are to be expected with Windows 98* (Memphis) and Windows NT5.0*. Also, as specific classes of devices reach maturity, we may expect generic class drivers to be included with future operating systems.

Other PC connectivity specifications are on the horizon. Where does USB fit in with IEEE 1394 for example?

Whalley--USB is aimed at volume PC peripherals needing sub-10Mb/sec. bandwidth such as human interface devices, CTI, audio and imaging devices. IEEE 1394a is designed to kick-in at 100-400Mb/sec. speeds for consumer electronic devices, while 1394b will address the needs of primary mass storage at 1Gb/sec. and more. They should each address different price/performance requirements with very little overlap. For example, USB and IEEE 1394 are

expected to play complimentary roles in Device Bay, the emerging specification for in-system peripheral expansion.

Where can I get up to date information about third-party design support for USB?

Whalley--A description of third-party development support, including device class driver development, BIOS, firmware and development tools is available at <http://developer.intel.com/design/usb/>

In addition, a list of USB products and contacts is posted at the USB Implementers Forum (USB-IF) web site: www.usb.org

We are anticipating the design of a USB product. Should we join the USB-IF? If so, why?

For \$2500 a year, the Implementers Forum provides access to high quality USB industry talent, who can help answer your technical questions, assist you to get a jump start on product development with tools and training, and guide you through compliance workshops to ensure a robust product that is ready for your critical launch date. The USB members have been very willing to help each other, regardless of the experience level.

How does USB voluntary compliance work?

Cadambi -- An important charter of the Implementers Forum is to enable robust and interoperable products. This is done through a combination of checklists and plugfests events. There are checklists for the cable/connector, silicon, hubs, etc. Each checklist is improved periodically based on actual usage feedback. At a plugfest, real peripherals, complemented by hand-crafted emulator tools, are cross-tested with a variety of PC platforms and hubs.

This process helps to establish confidence for both hardware and software. The test goals are improved with experience. It is not uncommon for a device to fail early testing, but there is no penalty applied! In fact, the aim is to encourage aggressive testing with as many configurations as possible. Based on recent attendance, the concept of voluntary compliance is being very well accepted.

When is the next USB Developers Event?

Whalley— The USB-IF is sponsoring the next USB Compliance Workshop on October 6-9 in South San Francisco, CA, USA. This is a typical USB industry plugfest where OEMs and IHVs will be on hand to test for compatibility and interoperability of their USB products. Judging from the success of recent USB plugfest events, you can expect a good crowd with good representation from a wide variety of USB platforms and peripherals.

For registration information, please visit the [USB-IF Events web page](http://www.teleport.com/~usb/calendar.htm#cwoc) at <http://www.teleport.com/~usb/calendar.htm#cwoc>

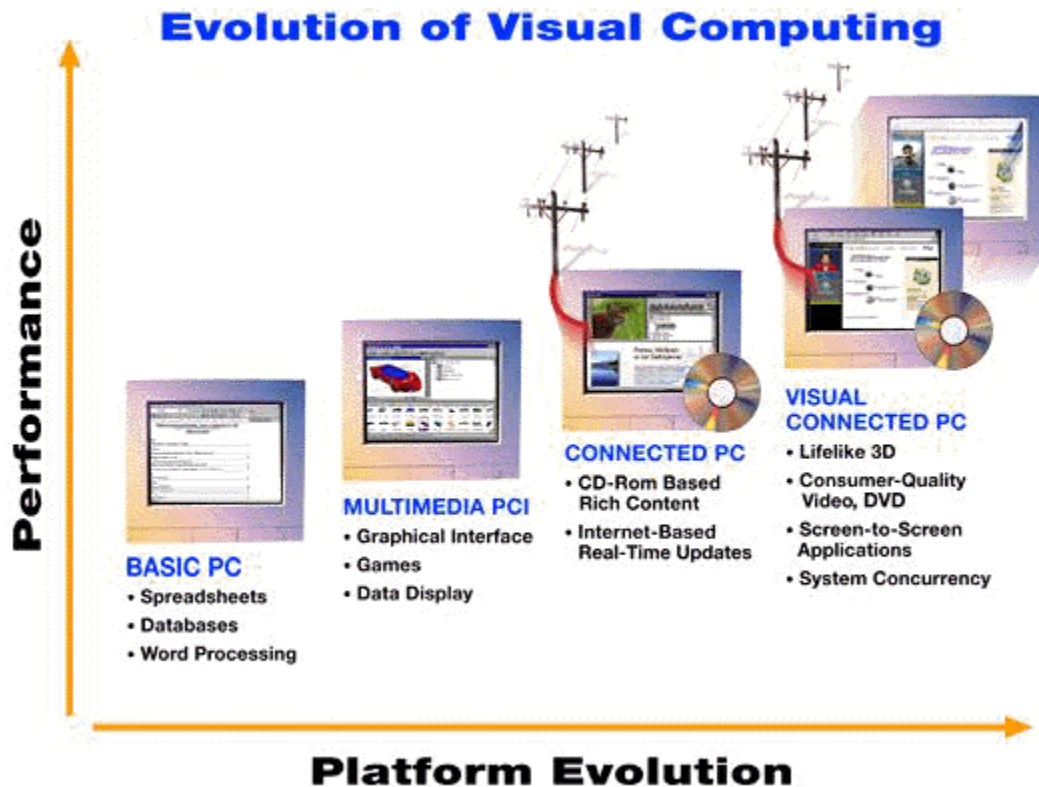
Focus:

Visual Computing

Since Visual Computing was introduced at Fall Comdex in 1996, Intel has made significant contributions to this important PC industry initiative, including the technical information, platform building blocks and development tools now needed to make the Visual Connected PC a reality at mainstream price points.

Emergence of the Visual Connected PC

Visual Computing is the next step in the evolution of the Intel architecture PC platform. In essence, Visual Computing describes the ability of the PC to deliver more life-like and interactive visual experiences to the user. These benefits are made possible by advances in processor and platform performance that build on the Connected PC to support improved PC imaging, high-performance 3D Graphics, and video processing. As shown in the illustration below, every major step in the evolution of the PC platform has enabled a major shift in the PC usage model, and the Visual Connected PC is no exception.



New PC technologies typically enter the market at the top end. Subsequent design and production improvements then rapidly improve price-performance and help the new technology achieve mass market acceptance.

The Visual Connected PC is now poised to enter mainstream PC markets. For years, such capabilities as digital imaging, 3D graphics, video processing and video communications have been possible on high-end PCs and workstations. Advances including the Pentium® II processor with MMX™ technology, Universal Serial Bus (USB), and Accelerated Graphics Port (AGP) are now rapidly improving the price-performance picture for Visual Computing.

Visual Computing Benefits Business and Consumers

The availability of technology at effective prices doesn't necessarily guarantee market acceptance. What will make the user community and specifiers demand visual computing capability?

The Internet has already begun to change the competitive landscape for business from competing for customers locally to competing for customers globally. Most businesses are marketing on the web directly to customers, and many are already closing sales on the web half way around the world. Much of the electronic commerce already taking place is business to

business and most of these electronic transactions occur without the aid of human support. At Intel we call it "screen to screen" communications. Whether it's employees within a company looking up information on an Intranet site, or sending email to one of your vendors, or consumers browsing your web site for product information, or even placing a call using internet telephony, it's transacted from one computer to another over the internet - "screen to screen". Sometimes there's another human on the other side looking at the screen (or looking at you in a video conferencing window) assisting your transaction and sometimes it's just you, your computer, and the computer on the other side of the line. Visual connected PC technology will enhance the "screen to screen" process improving business productivity and increasing the trend towards E-commerce.

Visual computing will make the consumer to computer interaction, and in-turn the consumer to business interaction, easy by way of realistic visual images that make the PC interface friendlier and more intuitive. The visual connected PC will allow consumers to browse through realistic visual images of items they wish to purchase: cars, houses, even everyday household items will appear as 3D images instead of text-based descriptions on a web site. Consumers will be able to take virtual 3D tours of theaters or sporting event locations prior to purchasing tickets online. A new and emerging class of visual business applications called Content Managers will arrive that go beyond today's browsers. Content managers will aggregate content and applications together and customize it for certain user groups or even individuals, enhancing the screen to screen process. We will see many new Internet-based applications like Content Managers that make E-commerce easier by way of visual computing technologies.

Not only will the consumer's shopping experience be changed, but personal creativity, communications, and entertainment will evolve as well. Creative content authoring is becoming commonplace as digital cameras improve in price and quality. The internet takes it a step further making it easier to communicate your creative content to associates, friends, and relatives. With the internet and the visual connected PC, sending photos and videos, and discussing them using PC telephony and video conferencing will be easy and cost effective. Entertainment will see vast improvements made possible by the visual connected PC. The Pentium II processor coupled with AGP is making arcade quality games possible on the mainstream PC, and interactive digital television by way of the visual connected PC is just around the corner.

As a whole, visual computing will provide easier access to information and people anywhere in the world increasing the value of the PC as a productivity, communications, creativity, and entertainment device.

Making the Visual Connected PC a Reality

Each aspect of Visual Computing makes unique demands across the PC platform. In the first half of 1997, Intel has focused on microprocessor performance, and then delivered the additional building blocks needed to balance system capabilities and reduce performance bottlenecks.

Fast Processor Performance:

With the introduction of the Pentium® Processor with MMX Technology, enhanced media and communications processing capability is now available on the mainstream PC.
(<http://developer.intel.com/design/MMX/index.htm>)

In June of 1997 Intel increased the available speed of the Pentium processor to 233MHz. By the end of 1997, all Intel architecture PC's will feature MMX technology.

In May Intel introduced the next generation in Intel processor performance with the Pentium II processor (<http://www.intel.com/design/PentiumII/>). The Pentium II processor adds advanced features such as dynamic execution and Dual Independent Bus architecture to the media and communications processing capabilities of MMX technology. With speeds up to 300 MHz, this is today's most capable engine for Visual Computing, and Intel plans further performance improvements in 1998.

System Bandwidth & Fast Memory:

The Pentium II processor has also improved system to memory bandwidth with the new Dual Independent Bus (DIB) architecture (<http://www.intel.com/design/PentiumII/prodbref/dibtech.htm>).

DIB architecture separates the processor's L2 cache bus from the system bus to achieve up to three times the performance bandwidth of the single-bus Pentium processor. The result is faster system performance for memory-intensive PC imaging, 3D graphics and video processing applications.

Intel is also working with memory vendors to keep up with the performance of faster processors and bus architectures. In mid to late 1998, the industry will see a transition from 66MHz to 100MHz SDRAM to complement new, faster Pentium II processors. Intel is also working on direct RDRAM to further enhance system memory bandwidth into 1999.

Graphics Acceleration:

Graphics acceleration further enables Visual Computing by reducing PCI bus bottlenecks. Accelerated Graphics Port (AGP) provides a separate bus for graphics accelerators that improves throughput, system concurrency and memory utilization (<http://developer.intel.com/technology/agp/>).

Intel recently announced the industry's first AGP chipset, the 440LX AGPset (<http://developer.intel.com/design/agpsets/440/>). Intel has also worked with graphics vendors to make AGP-based graphics accelerators available to complement the chipset.

AGP delivers 533 MByte/sec. peak bandwidth in 2X mode, compared to 133 MB/s peak bandwidth on the PCI bus. Intel is currently at work on an even higher performing 4X mode to be available in 1999, capable of a peak bandwidth of 1GByte/sec. Overall, Intel currently anticipates that the Pentium II processor and AGP will enable a 10X improvement in 3D graphics performance over the next 3 years.

Video Performance:

DVD has the ability to deliver very high quality, visually rich, interactive images, as well as high quality audio to the PC. Intel has worked with the DVD consortium to enable copy protection algorithms and MPEG2/AC-3 processing on the PC platform. Intel has also created a DVD Authoring Lab in Hillsboro, Oregon to support continuing development of interactive DVD titles.

Hardware-assisted DVD is now available on high-end PCs. By 1998, PCs will take advantage of the Pentium II processor to perform descrambling, video and audio decoding functions in software, bringing DVD capability to mainstream price points.

High Performance I/O & Peripherals:

Fully functional USB ports are now available on all currently shipping PC's allowing new low-cost digital cameras to easily plug into the PC. Intel has also developed a Portable PC Camera '98 Design Guideline to ease development of these cameras (<http://www.intel.com/imaging/trends/guidelin.htm>).

Taking these capabilities to the next level, Intel is now working to bring IEEE 1394 ports to the PC. This will make it possible to connect even higher performance peripherals like video camcorders and other consumer electronics devices.

Higher-Level Platforms for Home and Business

To speed time to market of these technologies Intel is developing higher level building blocks for Visual Connected PC platform implementations. In 1997 Intel introduced initiatives and products for PC Theaters for interactive digital entertainment in the family room; Creativity PCs targeted at PC Imaging and digital content creation, and the Network PCs (Net PCs) to bring screen-to-screen capabilities and improved manageability to the business desktop.

Intel has also brought Visual Computing capabilities to the Mobile PC platform with the introduction of the Pentium® processor with MMX technology and chipsets supporting USB connections for notebook computers

Enabling the Industry

Intel is working throughout the PC industry to enable millions of PC users to enjoy the benefits of the Visual Connected PC.

- Intel is working with industry partners through implementers forums to develop and refine baseline specifications for important initiatives including USB, AGP, DVD, IEEE 1394 and Open Arcade Architecture.
- Intel is also helping developers move "Beyond the Spec" by sharing detailed information resources and access to Intel architects through the new Intel Developer Forum series (see the top story on the Intel Developer Forum in this issue of Platform Solutions - (<http://developer.intel.com/solutions/issue/stories/idf.htm>)).
- Intel is also working with the software industry to enable new Visual Computing applications on the Intel architecture PC platform.

On an ongoing basis, Intel has the goal of providing developers with design guides, tools and products they need to help make Visual Computing a reality on mainstream PCs. Very soon all PC users will enjoy the benefits of interactive life-like visual experiences.

For More Information

- Intel Technology Series, Intel Platforms for Visual Computing
(<http://www.intel.com/intel/march24/index.htm>)
- A White Paper on Intel's Visual Computing Initiative
(<http://www.intel.com/intel/march24/techinfo.htm>)
- Intel Technology Series, The Future of Business Computing: The Visual Connected PC
(<http://www.intel.com/intel/june297/index.htm>)
- A White Paper on How Visual Connected PCs are Enabling New Ways of Doing Business "Screen-to-Screen"
(<http://www.intel.com/intel/june297/whitepap.htm>)

Platforms:

Business Platforms

The proliferation of hardware and software choices, and the explosion of the Internet and Intranet have made the business computing environment increasingly complex and expensive to deploy and manage. Intel is continuing to bring greater performance and capability to the standard business desktop PC, while at the same time increasing its efforts to make it easier to deploy and control.

With the introduction of the Pentium® II processor Intel has combined the power and capabilities of the Pentium® Pro processor with the multimedia and communications capabilities of MMX(TM) technology. Along with platform technologies like Accelerated Graphics Port (AGP), the standard business desktop now has the visual computing (<http://developer.intel.com/solutions/focus.htm>) capabilities of PC imaging, 3D graphics, and enhanced video processing that will take business computing to the next level and change the way businesses work with each other and with consumers.

Intel is now working with the industry on technologies that reduce the total cost of ownership and make PC's inherently easier to manage. The Wired for Management (WfM) initiative and Network PC (Net PC) platform are two examples of the tremendous progress made to enable greater control and lower Total Cost of Ownership (TCO).

Wired For Management:

Intel's Wired for Management (WfM) initiative is part of a broad-based industry effort to reduce the costs of business computing without compromising compatibility or performance. The initiative includes new hardware and software products, alliances with other industry leaders, education and development programs, and Intel-led industry efforts aimed at developing widely accepted manageability standards. Most importantly, the WfM initiative targets real reductions in the most expensive element of business computing: support.

The WFM Baseline Specification establishes a minimum set of management interfaces that enable such capabilities as remote configuration and installation of operating systems and software applications, remote control and diagnostics, and after-hours maintenance. OEMs can build further capabilities on this baseline to deliver even more value to their customers

Network PC (Net PC):

The Network PC, or Net PC, was born out of Intel's WFM initiative to reduce TCO without sacrificing necessary performance. The Net PC introduces a new category of business PC designed from the ground-up to be centrally managed, while simultaneously delivering the power and versatility of a traditional business desktop computer. The benefits of the Net PC include remote system configuration over the network, automated distribution of software, simplified remote diagnosis and maintenance, asset management support and a sealed chassis. The built-in manageability features and locked chassis of the Net PC give IT (Information Technology) support staff a known entity, while at the same time locking systems to reduce unauthorized or unplanned changes in the client.

Wired for Management

What's New:

- Wired for Management Baseline Specification Version 1.1 released
(http://www.intel.com/managedpc/wired/wfm_spec.htm)
 - * Now Includes Mobile and Server
- Intel updates Managed PC ToolKit with latest WfM Building Blocks:
(<http://developer.intel.com/ial/dmi/>)
 - * Intel DMI 2.0 Service Provider SDK
 - * Managed Object ToolKit
 - * Intel Mobile Component Instrumentation (IMCI) SDK
 - * Latest Specs, white papers, and reference materials
- System Management BIOS specification version 2.1 now available
(<http://www.intel.com/managedpc/standard/smbios.htm>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

"Manageability" is a **BIG** subject and the focus of several industry-wide initiatives. Intel's Wired for Management (WfM) initiative seeks to raise the level of management capabilities for mobile, desktop, and server platforms. The complementary Zero Administration for Windows* initiative from Microsoft* seeks to create more manageable operating systems and applications. The collective goal of these initiatives is to help plan, deploy, proactively maintain, and centrally control a distributed computing environment, in order to reduce the overall cost of owning and managing computers in the enterprise.

The WfM Baseline describes a consistent set of management capabilities which defines the minimum functions delivered in a target platform. These include requirements for instrumentation, remote wake-up, power management and service boot capability. Along with the WfM Baseline specification, Intel has produced a set of development tools designed to ease deployment of these capabilities. These include the Intel DMI 2.0 Service Provider SDK, the Managed Objects Toolkit for rapidly developing management applications, and the Mobile Component Instrumentation SDK for laptops.

Benefits to Users:

The benefits of WfM baseline-compliant systems are clear. It enables centralized system management: inventory, fix/repair, configuration and diagnostics, and provides for off-hours maintenance to minimize downtime. Picture a user who's having a problem with a built-in fax program and calls the company support hotline. The user continues using the system while a support technician remotely views the user's configuration and discovers that some files are mismatched to the hardware. The technician makes the needed changes and updates the correct files, all in the background, while the user continues working. Another common scenario is where the IT administrator updates to the latest version of the office productivity application suite automatically during the middle of the night without any user intervention.

Benefits to Manufacturers:

The WfM Baseline is easy for OEMs and developers to adopt and deploy and is based on industry standard management technology. DMI 2.0, for example, is a non-proprietary interface that is easy for vendors to adopt. In addition, DMI is independent of any specific operating system, hardware platform or management protocol. The interface is scalable to accommodate a wide range of products and mappable to existing management and remoting protocols.

Intel's ManagedPC ToolKit makes it easy for OEMs to adopt and deliver management capabilities. The tools encourage the addition of value added features on top of the WfM Baseline within its open-specification structure. The Baseline also provides a consistent target for applications developers including enterprise-wide management solutions.

Industry Status:

Released in April 1997, the WfM Baseline specification and its companion, the Network PC (Net PC) specification, have received wide industry support from a variety of key industry players. These include: Dell*, Hewlett-Packard*, IBM Corp.*, Packard Bell NEC*, Toshiba*, AST*, Acer America Corp.*, Gateway 2000 Inc.*, Mitac International Corp.*, Mitsubishi Electric PC Company*, Pionex Technologies*, Unisys Corp.*, and Zenith Data Systems*.

(See the specification press release for more information at

<http://www.intel.com/pressroom/archive/releases/nw31297b.HTM>). In June the WfM Baseline specification was extended to include support for Mobile and Server platforms.

(For Mobile, visit <http://www.intel.com/pressroom/archive/releases/NW060297.HTM>,

For Server visit <http://www.intel.com/pressroom/archive/releases/wm063097.htm>)

Intel and Microsoft are working closely to align their management technologies. This is evident in the work that produced the Network PC (Net PC) specification, which was co-authored by Intel and Microsoft along with other industry partners. The two are continuing to assure that next generation Windows* operating systems are compatible with today's management technologies. This includes joint work on the PC 98 System Design Guideline just released, and the Windows Hardware Instrumentation Implementation Guide (WHIIG) expected to be available in late 1997 or early 1998.

Next Steps:

If you are currently designing desktop PCs, mobile systems or servers now is the time to incorporate the Baseline manageability features into your future products. Get an early start by attending the Intel Developers Forum (9/29-10/1) (<http://www.intel.com/intel/idf>) for more in depth technical training and an impressive array of development tools, technical tips and implementation details on manageability.

For More Information:

Intel's ManagedPC (<http://www.intel.com/managedpc/index.htm>) web site contains detailed design information on all aspects of manageability.

For more information on Mobile manageability, please visit the Mobile PC Manageability site (<http://www.intel.com/mobile/entrprse/managePC/index.htm>)

Helpful development tools may be downloaded from the Managed PC ToolKit (<http://developer.intel.com/ial/dmi/>) site for immediate deployment.

A collection of white papers and specifications for developers may also be obtained from Intel's WfM Support for Developers Site (<http://www.intel.com/managedpc/develop/develop.htm>).

For more information on the Network PC (NetPC) visit Intel's Net PC web site at (<http://www.intel.com/businesscomputing/netpc/>)

For information on Intel's software building blocks and remote management products visit (<http://www.intel.com/managedpc/products/products.htm>)

For more information on DMI and the DMTF visit the industry DMTF web site at (<http://www.dmtf.org>).

For information on Microsoft's Zero Administration for Windows (ZAW) visit their web site at (<http://www.microsoft.com/windows/zaw/>)

Network PC (Net PC)

What's New:

- Network PC (Net PC) System Design Guidelines
(<http://www.intel.com/managedpc/standard/netpc.htm>)
- Wired for Management Specification 1.1
(http://www.intel.com/managedpc/wired/wfm_spec.htm)
- Net PC Case Studies
(<http://www.intel.com/businesscomputing/netpc/>)
- Net PC's Introduced by Intel and the Industry
(<http://www.intel.com/pressroom/archive/releases/wm061697.htm>)
- Intel Developer's Forum - Wired for Management Track
(<http://developer.intel.com/intel/idf/>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

The Network PC, or Net PC, is a new category of business PC intended to reduce ownership costs through its advanced management capabilities while delivering the power and versatility of traditional business PCs. Advanced system administration features, including remote configuration and repair and the ability to "wake up" systems for off-hours maintenance, give IT organizations greater centralized management capabilities while retaining existing LAN infrastructures. Hard disk drives give users the choice of running their Windows*-based business software and storing data locally or on servers.

The Network PC System Design Guidelines specify a number of advanced manageability features that enable easy, central administration. These include:

- **Remote boot.** The system can boot from a management server to receive downloads or updated operating system software or applications.
- **Remote wake-up (Wake-On-LAN* technology).** The system can be turned on remotely for after-hours maintenance.
- **DMI 2.0 support.** System elements using the Desktop Management Interface can be recognized and managed by industry-standard management software.
- **Instrumentation.** System elements such as the baseboard, processor, disks, mouse, keyboard, BIOS and video card can identify themselves and provide management information to standards-based management software.
- **SMART hard drive.** The disk can indicate when it may be about to fail, giving the user time to avoid data loss.
- **Hardware monitor.** The system tracks various indicators of hardware health, such as temperature or chassis open.

Net PCs are "managed" business PCs that cover the full range of price/performance, including high-power systems based on Intel's Pentium® II processor. Products based on the guidelines are emerging at a wide range of performance levels and price points. The Net PC System Design Guidelines was developed by Intel, Microsoft*, Compaq*, Dell* and Hewlett-Packard*.

Benefits to Users:

With its advanced management technologies, controlled configurations and sealed case, the Net PC gives IT managers increased control over the distributed computing environment. In addition, The Net PC offers a platform that is cost-effective to deploy, manage and support, without sacrificing the desktop computing power, local storage and application flexibility that make the PC a versatile and powerful tool for users. By combining PC versatility and performance with centralized, network-based manageability, the Net PC truly delivers a valuable new tool for business. The Net PC is most appropriate for companies centralizing PC management and for those data- and task-focused users who need no hardware expandability.

For example, it is ideal for information delivery, customer support, manufacturing, finance and training.

Benefits to Manufacturers:

The overall Net PC solution is spurring the adoption of manageability by driving initiatives to increase base client management capability. By designing to the Net PC System Design Guidelines OEMs will be able to integrate network-based remote manageability features into their business desktop PC product lines.

Industry Status:

Intel's announcement of the Wired for Management (WfM) initiative in September, 1996 generated considerable enthusiasm for managed PCs from OEMs, independent workgroup and enterprise management software vendors, and end-users. Intel has followed up the initial announcement with a series of events and tools delivered to the industry in 1997. The following events have taken place this year to further enable manageability in PCs and servers:

- ***Publication of the Wired for Management Baseline 1.0***
- ***Publication of the Net PC System Design Guidelines***
- ***Net PC Interoperability event***
- ***Net PC Introduction and Product Announcements***
- ***Publication of the Wired for Management Baseline 1.1***
- ***Publication of the Wired for Management tool kit***

Net PCs are expected to be shipping in the third quarter of 1997.

Next Steps:

Intel will be sponsoring its second Net PC/Wired for Management (WfM) Interoperability Event of 1997 for PC system vendors (Sept. 22 - Sept. 26). The primary purpose of this event is to deliver the benefits of the Net PC, desktop, and laptop PC manageability offered by the WfM Baseline Guidelines 1.1 to a global collection of PC companies. The scope of this event will include the first common gathering of enterprise and workgroup management software vendors also in support of Wired for Management.

In addition, the upcoming Intel Developer's Forum (Sept. 29 - Oct. 1, 1997) will serve as the industry's best source of tools and training for advanced hardware developers. The Forum will feature three days of in-depth technical sessions and demonstrations presented by Intel's lead Net PC system architects, with a particular focus on the latest Intel technologies of Wired for Management.

For More Information:

For more details on the Wired for Management initiative, visit [Intel's Managed PC web site](http://www.intel.com/managedpc/) at (<http://www.intel.com/managedpc/>).

For more details on Net PCs, visit [Intel's Net PC web site](http://www.intel.com/businesscomputing/netpc/) at (<http://www.intel.com/businesscomputing/netpc/>).

Platforms: (continued)

Home Platforms

The Home PC is already the center of creativity, entertainment and education in many households today. With the advent of the Pentium® II processor and Dual Independent Bus (DIB) architecture, and new platform technologies such as AGP, USB and DVD, the home PC is bringing new compelling capabilities to both experienced consumers and first-time buyers. The introduction of Intel's Pentium II processor, when combined with the internet and the emergence of PC photo processing, video editing, 3D graphics, digital audio, and video phones is changing the way we work, learn, play, and communicate using our PCs at home.

Advancing the processor and platform technologies is critical to driving new levels of performance and capability that enable new and exciting PC platform uses. These new platform technologies go hand in hand with the enhanced capabilities of the Pentium II processor. Now available at speeds of 233, 266, and 300mhz, the Pentium II processor combines the advanced features of Intel's sixth generation processor, like Dynamic Execution and Dual Independent Bus architecture, with the enhanced multimedia and communications processing power of MMX® technology.

The Pentium II processor delivers the best performance on all three vectors of computing: integer execution - delivering higher performance on all consumer software; floating point - delivering improved 3D graphics for more realistic images and games; and multimedia- using MMX Technology to deliver improved imaging, video, and communications. When combined with Intel's newest AGP chipset, arcade quality graphics and DVD are possible now on the mainstream consumer PC.

Educated consumers are demanding the best PC performance to be ready for new and exciting applications. Multi-purpose PC's are evolving into special categories focused to meet the needs of these educated consumers. Two major trends have emerged in consumer PC usage today: Creativity and Entertainment. Intel is enabling platform improvements that support these trends through the Creativity PC and the Entertaining PC initiatives.

Creativity PC

The Creativity PC (<http://developer.intel.com/solutions/tech/creapc.htm>) enables enhanced multimedia and imaging capabilities to make possible:

- Personal Photography and Albums
- Audio mixing and re-mixing
- Video editing
- Communicating your creations with family and friends

The emergence of low-cost digital cameras with USB connectivity is making the Creativity PC a hot new category this year. These cameras utilize the PC processing power of the Pentium II processor with MMX technology to allow you to capture, store, edit, and send digital photos over the Internet.

Entertaining PC

The Entertaining PC takes the traditional consumer desktop multimedia PC to a new level of capability using the Pentium® II processor, DIB architecture, AGP, DVD, and AC '97 Audio. Consumers who enjoy games and edutainment will now be able to experience a dramatic new level of 3D realism. With the inclusion of DVD drives, the Entertaining PC allows the user to playback high quality DVD movies and take advantage of rich interactive DVD applications. With DVD, ISVs are taking advantage of the increased storage capacity to provide higher quality video, audio and graphics in games, edutainment and reference applications. Please see the following pages in Platform Solutions to learn how Intel is enabling these critical Entertaining PC platform technologies.

AGP (<http://developer.intel.com/solutions/tech/agp.htm>)
DVD (<http://developer.intel.com/solutions/tech/dvd.htm>)
Audio (<http://developer.intel.com/solutions/tech/audio.htm>)

Creativity PC

What's New:

- Pentium® II processor based systems available in retail from major PC manufacturers
Lots of information available on the benefits of the Pentium II processor for the Home platform. (<http://www.intel.com/home/PentiumII/index.htm>)
- Portable PC Camera '98 Design Guideline available now!
(<http://www.intel.com/imaging/trends/guidelin.htm>)
- Intel's new PC Imaging Site
Lots of new information including links to Intel's Smart Video Recorder III and Kodak's FlashPix* file format site (<http://www.intel.com/imaging/index.htm>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

The Pentium II processor, when combined with cool creativity software, enables new capabilities in:

- Video editing and playback (Splice 'n dice your own videos)
- Audio remixing (Mix your own sound tracks)
- PC Imaging (Capture, edit images, store and share with friends)

Imaging software has exploded with many popular titles designed for Intel MMX™ technology which brings significant performance to the category. Today digital cameras, scanners and photo printers are widely available at affordable prices. Audio creativity has hit mainstream. Previously audio was only available to musicians with special input devices and complicated software. Now with consumer software and the power of the Pentium II processor anybody can be a musician.

Some of the features expected on the 1H'98 Pentium II processor based Creativity PC SKUs are: Video capture; audio and video in/out connectors; USB connectors; CD-recordable/Zip drive; PCI audio (AC'97); POTs video conferencing camera; software for video, image, and music editing.

PC OEMs also have the opportunity to include Imaging peripherals like scanners, photo printers, and digital cameras.

Other technologies developing on the consumer platform to support Creativity PCs either now or in the future are:

USB - (<http://developer.intel.com/solutions/tech/usb.htm>)
1394 - (<http://developer.intel.com/solutions/tech/1394.htm>)
AGP - (<http://developer.intel.com/solutions/tech/agp.htm>)
DVD - (<http://developer.intel.com/solutions/tech/dvd.htm>)
Digital Audio - (<http://developer.intel.com/solutions/tech/audio.htm>)

Benefits to Users:

The Pentium II processor based PC is the center of Creativity. It is unparalleled in handling pictures and video on your PC. New uses for consumers include photo management and albums, photo editing, personal publishing, Internet post cards, video editing, music creation, and 3D for fun. Here are some examples of what consumers can do with their creativity PC's:

- Entertainment: Digital “shoebox”, Personalized cards, Family tree, Games, Hobbies, Home Movies
- Utility: Book reports, Asset inventory, Home improvements
- Sharing: E-mail, WWW, Prints
- Video/Image management: Archival, Retrieval
- Image manipulation: Enhancement, Orientation, Size
- Video editing: add text, special effects, transitions
- Small Business: Presentations, Sales collateral, Product catalogs, Brochures, Newsletters, Publishing

The PC just got more exciting with the Creativity PC!

Benefits to Manufacturers:

New opportunities to sell new PCs and peripherals. Consumers are looking to buy digital cameras and PCs that have creativity capabilities.

Industry Status:

Creativity PCs are available now! PC OEMs are quickly recognizing the purchasing power of this prospective audience. New creativity PCs are available now from major manufacturers. More are expected in 1998 as the Pentium II processor moves into the volume mainstream.

Next Steps:

Offer Pentium II processor based Creativity PC SKUs in 1H'98 with video editing software, video capture, CD-recordable storage, audio and video in/out. Look for opportunities to sell peripherals and software as part of your Creativity PC SKU. Other opportunities include providing incentives for end-user purchase of peripherals and software.

Like Intel will be doing, promote the Creativity PC in the channel and in advertising to increase awareness for the category.

For More Information:

Lots of information available on the [usage of Intel's Pentium II processor for the Home](http://www.intel.com/home/PentiumII/index.htm) at <http://www.intel.com/home/PentiumII/index.htm>

[Intel's new PC Imaging site with lots of new information including links to Intel's Smart Video Recorder III and Kodak's FlashPix* file format site](http://www.intel.com/imaging/index.htm)
(<http://www.intel.com/imaging/index.htm>)

Information available on other technologies developing on the consumer platform to support Creativity PCs either now or in the future:

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AGP - (<http://developer.intel.com/solutions/tech/agp.htm>)

DVD - (<http://developer.intel.com/solutions/tech/dvd.htm>)

Digital Audio - (<http://developer.intel.com/solutions/tech/audio.htm>)

Platforms: (continued)

Mobile Platforms

Worldwide demand for notebook computers is healthy and growing -- because notebooks are meeting user needs. Mobile PCs today offer desktop-class capabilities and performance and the portability that an increasingly mobile world demands.

Providing users with the flexible environment they require has always been a challenge. IT management challenges include affordability, maintenance, administration, productivity and security. Notebook users need desktop equivalent capabilities in a mobile form factor. They also require seamless communications -- over the LAN, the phone line, and through wireless technologies.

Intel meets those challenges with its mobile computing vision: anytime, anywhere performance and productivity. Intel is committed to delivering cost effective, high performance computing, remote manageability, and mobile communications.

Intel's mobile roadmap is focused on delivering high performance/low power processors and chipsets, along with the Intel driven initiatives including mobile manageability and wireless data communications.

Manageability:

Intel is leading the industry to define and deliver the managed mobile PC. For mobile, offering remote manageability and reducing the total cost of ownership (TCO) are key concerns. The TCO for notebook computers is higher than for desktops, largely due to IT support costs.

Mobile computers are only occasionally connected, they have a smaller 'pipe' connection, and they tend to use a variety of dynamically swappable devices. But administrators still need all of the desktop management features, such as software distribution, asset tracking, and remote diagnosis/repair, plus additional features to address unique mobile challenges.

By offering mobile manageability solutions -- such as tools to enable platform instrumentation, as well as the LANDesk Client Manager application -- we are able to lower the total cost of ownership while providing mobile clients and administrators with reduced downtime and higher productivity than ever before.

Several leading manufacturers are already shipping early versions of managed notebooks today. These systems provide desktop equivalence while connected to the LAN. And Intel will help OEMs to enable fully instrumented notebook platforms and remote dial-up by the first half of 1998.

Mobile Data Initiative:

Formed and led by Intel, the Mobile Data Initiative is a cross-industry effort to provide mobile PC users with an easy and affordable wireless connection to data networks, using cellular telephones linked to mobile PCs.

The Mobile Data Initiative unites three exciting technologies. The combination of powerful mobile PCs, digital wireless telephony, and the Internet gives business users new resources that they can leverage while out of the office. With these new products and services, business professionals have fast, reliable and cost-effective access to information wherever their business takes them.

Mobile Data Initiative

What's New:

- North American MDI Introduced - press release, August 1997
<http://www.intel.com/pressroom/archive/releases/mp080497.HTM>
- See who the North American MDI members are
<http://www.pcsdata.com/participants.htm>
- History of the MDI
<http://www.intel.com/mobile/entrprse/mdi.htm>
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

The Mobile Data Initiative (MDI) is an affiliation of leading technology companies including mobile phone network operators, telecommunications vendors, and mobile PC hardware and software manufacturers. Intel established and leads the MDI with a goal of enabling mobile users to stay connected via a simple, cost-effective wireless connection to data networks.

MDI endorses GSM (Global System for Mobile Communications) technology as the best way to exchange data wirelessly today. GSM is secure, reliable, and has the most extensive global coverage of all digital networks. In fact, GSM is used by over 44 million people throughout the world today. PCS1900, an adaptation of the GSM standard for North America, is compatible with GSM networks in Europe and elsewhere around the world. MDI will also endorse other digital wireless telephony technologies as soon as they become business-ready.

Benefits to Users:

Wireless mobile computing completes the business traveler's remote office by making it possible for traveling professionals to stay connected anytime -- anywhere their business takes them.

By simply connecting a digital wireless telephone to a notebook computer, business travelers can remotely gain secure access to all of the resources they have while in the office: e-mail, fax, corporate LAN, and Internet/intranet. So there's no need to wait for FedEx, a hotel fax, or even to locate a phone jack; users have immediate access to data and networks wherever they are, and critical information can be relayed on the spot. The downtime that travelers often experience, whether waiting for a flight, in a cab, or on a train can now be put to productive use through wireless mobile computing.

Best of all, it's easy. The technology leverages notebook PCs and mobile phones, both powerful tools that business travelers already use. So there's no need to learn to use a new device or to carry extra equipment along - the same phone business travelers use to talk can also be used to transmit data.

Benefits to Manufacturers:

Intel continues to spearhead the Mobile Data Initiative by bringing industry leaders together with a commitment to delivering seamless, integrated solutions. Intel held the first North American "PlugFest" in July 1997 to bring together leading manufacturers of notebook PCs, GSM phones, PCMCIA adapter cards, network data services, and software. Intel will continue to provide interoperability workshops for this community, and actively promotes the development of new products and services.

Intel and the MDI are also working to raise the awareness of this technology and its benefits. These efforts are designed to help spur customer demand for all the components of wireless mobile computing solutions: notebook PCs, wireless phones, PCMCIA adapter cards, access to digital wireless networks, and communications software.

Industry Status:

The North American Mobile Data Initiative was launched on August 4, 1997, following a successful European launch earlier in October 1996. The North American MDI currently has 12 core member companies, including the members of the GSM Alliance in the U.S. GSM networks have launched commercial service across the U.S.; voice service is available in nearly half the nation's top 50 metropolitan areas, and data service is coming to most markets soon. GSM networks now serve millions of subscribers worldwide, with a rapidly growing subscriber base in the U.S. Planned coverage will reach virtually the entire U.S. population.

MDI members will continue to introduce products and services that enhance wireless mobile computing throughout 1997 and 1998. Other technologies are currently being evaluated for inclusion in the Mobile Data Initiative.

Next Steps:

If you would like more information about the Mobile Data Initiative -- or would like to participate in the next "PlugFest" interoperability workshop -- please complete a form at one of the following web sites:

In North America, http://www.pcsdata.com/feedback_cgi.html

In Europe, http://gsmdata.com/feedback_cgi.html

For More Information:

To get more information about the MDI effort, visit the North American MDI website (<http://www.pcsdata.com/>).

Or, the European MDI website is at (<http://gsmdata.com>)

Intel's mobile computing/wireless data communications site also provides a broader view on wireless mobile computing issues and implementation in the U.S. as well as Europe. (<http://www.intel.com/mobile/entrprse/wireles.htm>)

Platforms: (continued)

Server Platforms

Intel architecture has been the engine at the heart of industry-standard, high-volume servers since the first i386™ PC was turned on its side and loaded with Netware®, well over a decade ago. Advances in server platform performance and capabilities since then have primarily been prompted by two fundamental forces: 1) Moore's Law-driven advances in microprocessor performance, and 2) competition and innovation enabled by widely adopted industry standards.

No one today would think of installing a server that didn't contain at least one PCI bus. Many server designs include two, three or more PCI buses for maximum bandwidth and throughput. Increasingly, servers are designed with 'smart' peripheral controllers that off-load the main processor from low-level I/O chores. Many different approaches to high availability and scalability using various clustering techniques are now starting to be widely used. Finally, storage subsystems are rapidly evolving from the relatively limited realm of SCSI to the practically unlimited environment of Fiber Channel and intelligent, network-attached storage devices.

The result of all of this technological innovation is more performance at a lower price, with freedom from proprietary lock-in as an added bonus. Intel is focused on four main technology areas to further advance the Standard High-Volume (SHV) server platform:

1) Scalability, 2) Manageability, 3) I/O, and 4) Flexibility.

Scalability

Ask four IT managers what they mean by 'scalability', and you will get at least four different answers. To Intel, 'scalability' means 'never being forced to turn away requests for service due to lack of computer system resources'. Intel and the SHV server industry are addressing the scalability challenge in two ways: 1) ongoing, rapid improvements in the performance and throughput of the core electronics complex, including Intel processors and chipsets, and 2) industry-standard, extremely high-performance methods of combining multiple SHV servers together into robust scalability clusters.

The Virtual Interface (VI) Architecture is the critical standard that Intel, Compaq, and Microsoft, along with over 100 contributor companies, are promoting for high-performance scalability clusters. Robust, high-performance SHV server building blocks, combined with industry-standard, high-performance clustering techniques (and the right kind of cluster-enabled database software), allows the construction of very high-performance and high-capacity server systems that are relatively low-cost when compared to proprietary alternatives.

Regardless of the scale of the workload, such systems will almost never have to turn down a request for service. They will exhibit virtually limitless scalability.

Manageability

As part of its Wired For Management (WFM) Initiative, Intel has recently added a server management section to the WFM Baseline Specification. Currently at a 1.1 revision level, Intel is working with leaders in the server management industry to create a 2.0 version of the WFM specification that addresses more of the manageability requirements that are unique to the SHV server platform.

The goal of WFM for servers is to define a broadly accepted and implemented 'baseline' level of instrumentation and management features that are available to all management tools written to the baseline. Intel does not expect to include all of the possible aspects of server management in the baseline. Manageability is a critical competitive differentiator for SHV server makers. Intel

expects that to continue. The WFM baseline specification for servers merely creates a 'starting

point' for server management that should be the minimum expectation for any server to be considered 'manageable'.

I/O

File and network input/output is the primary thing that servers do, whether the higher-level function they're performing is database, file/print, Internet, e-mail, etc. Server I/O capacity and throughput are crucial to the overall performance and headroom of the server application. Intel has been working for over a decade to improve server I/O subsystem capacity and throughput. From ISA to EISA to PCI, and on to multiple PCI buses in a single server, Intel provided much of the core technology and enabling silicon products that permitted these improvements.

Intel continues to work to advance the capabilities of the SHV server I/O subsystem. Next year, SHV servers will be able to accommodate next-generation 64-bit PCI cards. Operating at 33MHz, the 64-bit PCI bus in next year's server systems will be able to transfer a peak of 266Mbytes per second, twice today's 133Mbytes. In addition, next year's servers will provide more PCI expansion slots and more PCI buses than today's SHV servers can provide. The result is more I/O capacity and greater peak I/O performance, which will be required in order to keep pace with the much higher performance of the core electronics complex.

But raw performance is only part of the story. The overall system I/O architecture is also a critical element. Historically, SHV servers have used monolithic I/O drivers and controllers. These solutions provide good performance for a single card or I/O function, but they deliver that performance at a significant cost in terms of processor and interrupt load. The net result is often less aggregate performance than the system is theoretically capable of providing. So-called 'intelligent' network and disk interface cards have also been long available for SHV servers. These cards incorporate a microprocessor and use specialized drivers to off-load a portion of the I/O or networking functions from the main processor. What's been missing is an **industry standard** that allows **every** SHV server I/O subsystem to operate in an intelligent fashion.

The Intelligent I/O (I₂O™) specification provides just such an industry standard. It is targeted at resulting in better overall system performance, scalability and headroom, with the added benefit of reducing the amount of validation work required for new cards and drivers.

Flexibility

Today's SHV servers come in all shapes and sizes. Server vendors configure systems to fit specific purposes according to their market focus. Number of expansion slots and chassis designs vary enormously, among other options. There can never be a one-size-fits-all standard for servers. The range of applications and uses is simply too diverse. However, Intel believes that it is both possible and desirable to create industry standards for selected server modules, such that many different types of final systems can be successfully configured from standards-based building blocks.

Using a common set of building blocks, a system vendor or systems integrator could configure a very large-scale compute server, for example, with many multiprocessing compute nodes in a cluster, and relatively little I/O capacity. A large-scale data-warehouse platform could be constructed from many processor and I/O subsystem building blocks. The common denominators between all of these configurations are industry-standard building-block modules and standards-based, high-performance clustering interconnects.

Expect announcements from Intel and the industry in the near future on standard building-block modules and clustering interconnects.

Virtual Interface (VI) Architecture

What's New:

- SAP and Intel Announce Formation of SAP Intel Center of Expertise
The center will focus on VI Architecture, IA-64 Optimization, Network/Cluster technologies.
(<http://www.intel.com/pressroom/archive/releases/sp082597.htm>)
- Oracle and Intel Announced Development Collaboration focused on IA-64 and VI architecture
(<http://www.intel.com/pressroom/archive/releases/sp062397.htm>)
- VI Architecture Initiative to Define High-Speed Communication Interfaces
(<http://www.intel.com/pressroom/archive/releases/sp041697.htm>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

Over the last 15 years, high-speed networking hardware has advanced rapidly, with technologies such as ATM, Fast Ethernet and Fiber Channel offering orders-of-magnitude improvements over previous LAN and WAN technologies. On the software side, however, the overhead associated with communicating between the nodes of a large-scale cluster has remained essentially unchanged — until now.

The Virtual Interface (VI) Architecture is an open industry specification designed to facilitate the movement of distributed enterprise applications onto large-scale, high volume, Distributed Message Passing (DMP) clusters. The VI Architecture defines mechanisms for low latency, high bandwidth message passing between interconnected nodes and interconnect storage devices (e.g. clusters). Low latency and sustained high bandwidth are achieved by avoiding intermediate copies of data and bypassing the operating system when sending and receiving messages. Elimination of this overhead not only enables significant communication performance increases, but also results in a significant increase in the number of CPU cycles available for performing other tasks.

Benefits to Users (IT):

The cluster solutions available today depend on the use of non-standard interfaces, software and often hardware, usually running on only one hardware configuration and using one operating system. There is very little investment preservation as hardware and software technologies evolve. The VI Architecture defines a standard interface that allows distributed clustered applications a single hardware/software interface that results in more portable application code as technology advances occur. This portability allows customers to run their most complex enterprise-class applications on affordable, high-volume, open computing clusters whose high availability modularity and reliance on industry standards help reduce Total Cost of Ownership (TCO).

Benefits to Manufacturers:

The VI Architecture allows manufacturers to gain a framework for designing and building low-latency, high-reliability clusters for the volume space. The economies achieved through volume manufacturing of these systems allow clusters to be assembled at a fraction of the price, while surpassing mainframes and supercomputers in both performance and reliability. This fosters the growth of economical, innovative implementations, which offer more value to end users.

Industry Status:

The VI Architecture is in the definition phase, and is being jointly specified by Compaq Computer Corporation*, Intel Corporation and Microsoft Corporation*. Since the original development efforts began in January 1996, more than 100 other industry leaders have joined to endorse the collective endeavor. A preliminary specification of VI Architecture was distributed to participating vendors in January 1997 and a final specification is expected to be released later this year.

Next Steps:

Companies wishing to participate in the VI Architecture specification process should send an e-mail request for details to wire@co.intel.com.

For More Information:

Visit [Intel's Virtual Interface \(VI\) Architecture information](http://www.intel.com/procs/servers/index.htm) on the world wide web at <http://www.intel.com/procs/servers/index.htm>. Double click on Industry Alliances for Enterprise Computing.

I2O**What's New:**

- [I2O Compliance Workshop September 16 to test interoperability of I2O products](#)
Please visit the members-only section on the I2O web site for event information and registration. (<http://www.i2osig.org/>)
- [Detailed I2O information and specifications available at the I2O SIG](#)
(<http://www.i2osig.org/>)
- [Industry Status \(see below\)](#)
- [What's New \(see below\)](#)

Technology Description:

The I₂O[®] Architecture is a software specification that provides a standardized framework for the implementation of intelligent I/O subsystems. The two primary objectives of the I₂O specification are to improve system level performance by off-loading the host CPU of I/O tasks, and to enable the general portability of I/O device drivers across operating systems. The concept of intelligent I/O was first introduced in mainframe systems to balance the I/O and compute power of the platform. Special "channel processors" were used to control I/O-specific tasks in these proprietary solutions. The I₂O architecture revolutionizes the concept of intelligent I/O in the light of the new computing industry by providing an industry accepted specification for the development of intelligent I/O solutions.

The I₂O specification replaces the standard monolithic device driver with a two-piece driver model composed of the Hardware Device Module (HDM) and the OS Services Module (OSM). The HDM runs on the I/O processor (IOP) and serves as the interface to the target I/O device. The OSM runs on the host processor and serves as the interface to the host operating system. OSMs are developed for each I/O class defined by the specification, and are unique to each operating system. The HDM and OSM communicate over a *messaging layer* using a defined message-passing protocol. This decouples both the underlying bus or interconnect topology and the HDM of the I/O device from the host OS. For a given device, a single HDM can be developed and used with any OS supporting the I₂O specification. This model also provides the capability for direct communication between HDMs, thereby laying the foundation for peer-to-peer data transfers. In addition, it allows for stackable drivers, providing the capability to add functionality to standard devices, e.g. adding a third party's RAID firmware to any SCSI device driver.

Benefits to IT Community:

The I₂O architecture naturally delivers improved system throughput as a result of incorporating an I/O processor that off-loads the host CPU of substantial I/O tasks. In addition, the I₂O architecture is an essential part of increasing *scalability* in standard, high-volume (SHV) servers. The ultimate goal of scalable platforms is to provide unlimited ability to expand system resources and still produce proportionally greater performance. Once achieved, a scalable environment is clearly a big win for the IT Community.

Another key benefit is the interoperability that the I₂O architecture provides. The split driver functionality of the I₂O architecture will simplify the task of integrating systems and managing the complex environments with multiple OSs and I/O technologies that are typically found in an enterprise.

Benefits to Manufacturers:

The I₂O architecture also brings the benefit of accelerating adoption of new I/O technologies, e.g. ATM, Fast Ethernet and Fiber Channel. By reducing the effort required to develop and maintain device drivers, more resources can be applied to I/O innovation. In addition, less time is spent by OEMs and IT departments testing and validating the multitude of peripheral cards and drivers that are certified with any given platform. Once an HDM is validated to communicate properly with the messaging layer, it is then expected to work with all future versions of any OS that complies with the I₂O specification.

Industry Status:

The development of the I₂O specification is an industry-wide initiative led by the I₂O Special Interest Group (SIG). Originally established in January of 1996 by a group of computer industry vendors (including Intel), it now has an active membership of over 120 companies. For more information on the I₂O Architecture, SIG membership, access to the specification, or developments as an industry initiative, visit the [I₂O SIG web site](http://www.i2osig.org/) (<http://www.i2osig.org/>)

Since the inception of the I₂O SIG® in early 1996, membership in the SIG and product announcements have been growing at a significant rate. The industry saw the first demonstrations of I₂O technology at last year's Fall COMDEX, including demos from server vendors Compaq Computer* and Hewlett-Packard*; storage and networking vendors Adaptec*, 3Com* and Symbios Logic*, as well as OS vendors Microsoft*, Novell* and SCO*. Intel has been playing a major role in the I₂O initiative, providing I₂O architecture building blocks. These solutions include highly integrated I/O Processors (featuring an I₂O architecture messaging unit, PCI-PCI bridge and embedded CPU based on the i960® architecture) and server platforms featuring an Intel IOP and I₂O architecture solutions.

Member companies are committed to proliferating the benefits of the I₂O architecture and are working together to ensure compliance as well as performance. The next compliance workshop will be held in September to ensure the interoperability of products based on the I₂O specification.

Next Steps:

In an I₂O-enabled computer industry, everyone's a winner! If you're involved in I/O hardware or software development, join the I₂O SIG and start investing in the technology that your customers will require. The I₂O Specification is available through the [I₂O SIG web site](http://www.i2osig.org/), which also provides information on how to become a SIG member and gain access to the on-going forums that provide invaluable guidance for your product development decisions. If you are an IT manager or system administrator, familiarize yourself and your team with the concepts of the I₂O architecture and consult with your equipment providers about how they plan to implement I₂O architecture solutions in their coming products. The [I₂O SIG web site](http://www.i2osig.org/) also contains interesting content for non-developers, including vendor announcements, SIG events and industry developments.

For more information:

Visit [Intel's Intelligent I/O Processor web site](http://www.intel.com/design/iio/) for more details
<http://www.intel.com/design/iio/>

Visit the [I₂O Industry SIG website](http://www.i2osig.org/)
<http://www.i2osig.org/>

Platforms: (continued)

Workstation Platforms

Workstations based on Intel microprocessors have been very competitive at the entry level of the workstation marketplace. They are now demonstrating their power in the midrange and beyond with the Pentium® II

(<http://www.intel.com/businesscomputing/wrkstn/PentiumII/index.htm>) and Pentium® Pro (<http://www.intel.com/procs/ppro/wrkstn/index.htm>) microprocessors. That's good news for any company that wants great workstation performance and open system architecture benefits at a fraction of the cost of traditional workstation systems.

Workstation users demand levels of performance that, until recently, could only be delivered by vendors competing on the basis of proprietary, vertically integrated solution "stacks" with little cross-vendor compatibility. Now, that situation is changing. A generation of workstations built around either single or multiple Intel Pentium II or Pentium Pro processors extends the value economics of the PC industry into workstations.

Intel has assembled a team of workstation experts in the new the Workstation Products Division (WPD) at Intel to supply building blocks, technologies and programs to OEM's and software developers to accelerate the development of the Intel architecture workstation market. System vendors (http://www.intel.com/procs/ppro/wrkstn/wks_sys.htm) and applications providers alike have been quick to embrace the Pentium II processor's computational muscle and the maturity of Windows NT for workstation use.

Standard Architecture

The biggest benefit of a single architecture that scales from personal computers to workstations is maximum access to the innovations in both. For users, the new workstation industry provides high performance with outstanding price/performance. It also contributes significantly to lowering the total cost of ownership (TCO) of workstation computing. In essence, more space and convenience to engineering, lower cost per resource to management, lower support costs, and less need for duplicate equipment.

High-Performance

At the heart of the new workstation architecture is Intel's Pentium II processor introduced in May 1997. The Pentium II processor, currently available in frequencies up to 300MHz, delivers the performance required for workstation applications. (For performance info please visit <http://www.intel.com/businesscomputing/wrkstn/PentiumII/perf/>)

Over the coming months you will continue to see exciting announcements in the area of workstation advancements based on the Intel architecture. These systems will possess all the key features you have come to expect from an engineering workstation, at an incredible price point:

- High-performance CPU
- Sophisticated 3-D graphics subsystems
- Built-in scalability
- Fast, highly expandable I/O, including advanced networking support
- Configurability to support hundreds of megabytes of RAM and terabytes of disk storage

Complete Solutions

A successful workstation is much more than a powerful processor. Intel is committed to continue working with other companies throughout the industry to ensure that all the technologies and products are in place to deliver optimal workstation solutions based on the Intel architecture.

For more information about Intel Architecture based workstations, please visit Intel's Workstation web site (<http://www.intel.com/businesscomputing/wrkstn/index.htm>)

Technologies:

Microprocessor

What's New:

- Introduction of New High Performance, Low Power Mobile Pentium® Processor With MMX™ Technology showcasing Intel's 0.25 micron process (<http://developer.intel.com/design/mobile/>)
- Pentium® II processors now available for business, workstation, consumer, and server platforms (<http://www.intel.com/pentiumII/home.htm>)
- Dual Independent Bus (DIB) architecture delivers higher system bandwidth (<http://www.intel.com/PentiumII/specs/dib.htm>)
- Intel introduces versions of the Pentium II processor with Error Correction Code (ECC) (<http://www.intel.com/pressroom/archive/releases/SP071497.HTM>)
- New Intel Technology Journal features in-depth information on Intel's research & development of key technologies (<http://developer.intel.com/technology/itj/index.htm>)
- Industry Status (see below)
- Next Steps (see below)

Technology description:

The Pentium II processor is the most advanced processor with Intel MMX™ technology. Delivering Intel's highest performance on the three vectors of computing: floating point, integer, and multimedia, the Pentium II processor provides ample headroom for applications such as high-end operating systems, business media, PC imaging, communications and more.

The Pentium II processor is available in 233MHz, 266MHz, and 300MHz versions for desktops, workstations and servers. The processor uses the high-performance Dual Independent Bus (DIB) architecture to deliver higher system bandwidth to complement its high processing power. The Single Edge Contact (S.E.C.) cartridge design includes a dedicated 512KB level two (L2) cache. The Pentium II processor also includes 32KB of L1 cache (16K data, 16K instruction), twice that of the Pentium® Pro processor. Error Correction Code (ECC) memory is now available on the L2 cache for added data integrity and reliability, making the Pentium II processor the preferred choice for single and dual processor workgroup and web servers.

For more information visit the Pentium II processor home page at <http://www.intel.com/PentiumII/home.htm>

Or, for more detailed information please see the Pentium II processor Technical Fact Sheet at <http://www.intel.com/pressroom/archive/releases/dp5797fs.htm>

Benefits to Users:

Together, systems designed with the Pentium II processor and the 440LX AGPset make multimedia software come alive. Great 3D graphics, color depth and smooth animation allow for a more lifelike experience for realistic games, educational and hobby software. The Pentium II processor also enables new capabilities in PC imaging, video editing and playback, and audio remixing. Improved video performance also means crisper, clearer images for video playback and editing. Pentium II processor-based systems bring home rich and exciting pc entertainment experiences with new media technologies like DVD, MPEG-2, and AC-3.

In business, Pentium II processor systems are available for desktop, server and workstation platforms. The Pentium II processor family is fully compatible with previous generations of Intel Architecture processors. Both small and large businesses benefit from optimal performance with applications running on advanced operating systems such as Windows* 95, Windows NT* and UNIX*.

On top of its built-in Pentium Pro processor technology base (Dynamic Execution and DIB architecture), the Pentium II processor takes advantage of software designed for Intel MMX™ technology. This technology enhances full-motion video playback, color depth, and provides more realistic 3D and graphics images, plus offers other media enhancements. Intel is now shipping versions of the Pentium II processor including Error Correction Code (ECC) memory functioning on the level 2 (L2) cache. This type of cache enables servers and workstations to operate in business environments where data integrity and reliability are essential.

Benefits to Manufacturers:

Whether you're developing today's most advanced hardware platforms or leading-edge multimedia software, Intel's Pentium II processor brings you Intel's highest performance processor to date allowing you to offer increased performance and capability to business and consumer users. To help you get your own products to market as quickly and reliably as possible, the Pentium II Processor Developers' web site offers up-to-the-minute technical information--from product and platform specifications, tools, design guidelines, technology tutorials, related products, and programming and manufacturing support. Check back often at <http://developer.intel.com/design/PentiumII>

Industry Status:

The Pentium II processor family supports the evolution of the PC platform in four important ways:

- 1) Dual Independent Bus architecture
- 2) Intel MMX™ technology
- 3) Dynamic Execution
- 4) Single Edge Contact (S.E.C.) cartridge

These technologies are bringing enhanced performance and capabilities to make visual computing possible on PCs today. Platforms for the business, consumer, workstation, and server market segments are all shipping today. Intel will continue to bring higher performing microprocessors and complementary platform building blocks to enhance visual computing capabilities in the future.

Next Steps:

Developers: Base your next PC design, whether it is a business desktop, workstation, consumer desktop, or server on the Pentium II processor, and for optimal performance, integrate the Intel 440LX AGPset.

For More Information:

Pentium II processor home page - <http://www.intel.com/PentiumII/home.htm>

Pentium II processor developer information - <http://developer.intel.com/design/PentiumII/>

Dual Independent Bus (DIB) Architecture - <http://www.intel.com/pentiumII/SPECS/dib.htm>

MMX technology - <http://www.intel.com/pentiumII/SPECS/mmx.htm>

Dynamic Execution - <http://www.intel.com/pentiumII/SPECS/dynamic.htm>

S.E.C. cartridge packaging - <http://www.intel.com/pentiumII/SPECS/sec.htm>

Pentium II processor performance - <http://www.intel.com/procs/perf/PentiumII/index.htm>

Pentium II processor platform technologies -
<http://developer.intel.com/design/pentiumii/platform/index.htm>

Memory

What's new:

- [PC Platform DRAM Technology Directions](http://developer.intel.com/design/pcisets/rambus.htm)
(<http://developer.intel.com/design/pcisets/rambus.htm>)
- [Intel Announces the Intel 440LX AGPset](http://www.intel.com/pressroom/archive/releases/CS082597.HTM)
(<http://www.intel.com/pressroom/archive/releases/CS082597.HTM>)
- [440LX AGPset data sheets \(66MHz SDRAM\)](http://developer.intel.com/design/agpsets/440/index.htm)
(<http://developer.intel.com/design/agpsets/440/index.htm>)
- [440LXAGPset design guides](http://developer.intel.com/technology/agp/desguide/index.htm)
(<http://developer.intel.com/technology/agp/desguide/index.htm>)
- [Don't miss the Intel Developer Forum—Optimizing Memory Performance](http://www.intel.com/intel/idf)
(<http://www.intel.com/intel/idf>)
- [Industry Status \(see below\)](#)
- [Next Steps \(see below\)](#)

Technology description:

Intel's goal is to ensure that memory subsystems continue to support evolving platform requirements through 1998 and beyond. Mainstream memory bandwidth requirements will be satisfied by EDO and 66MHz SDRAM performance through the first half of 1998. Intel is also working with memory vendors to keep up with the performance of faster processors and bus architectures. For the past 12 months, Intel has worked with leading DRAM vendors to anticipate this need by developing 100MHz PC SDRAM Component and DIMM specifications. In the second half of 1998, the industry will see an adoption of 100MHz SDRAM to complement new, faster Pentium® II processors. Beginning in 1999, the PC platform will be enhanced by Direct RDRAM to further enhance the interactive lifelike visual experiences on the standard PC platform, including workstation-quality 3D graphics and consumer-quality video.

Benefits to users:

The emergence of 3D and video applications and the evolution of the PC platform to the Visual Connected PC keeps evolving the PC architecture. New PC designs that will be based on faster Pentium II processors in mid-'98 are driving the need for ever-higher system memory bandwidth. Intel's leadership and industry participation are delivering new memory technologies which enable the development of higher performance PCs.

Benefits to PC manufacturers:

Continuous work on PC SDRAM specifications helps PC manufacturers showcase platform performance and meet development targets for cost, availability and high-performance features. By working with the industry to develop PC SDRAM and DIMM specifications, Intel is helping to assure that memory products are built to support the next generation of platform requirements. Industry-wide compatibility helps PC OEMs line up multiple compatible DRAM suppliers to meet their cost and availability targets, while providing a high quality product to PC end users.

Industry status:

Intel's goal is to ensure that memory subsystems continue to support evolving platform requirements and to assure that memory does not become a bottleneck to system performance. It is especially important to assure that the PC memory roadmap evolves together with the performance roadmaps for the processors, I/O and graphics. To meet this goal, Intel has worked for the past 12 months with leading DRAM vendors to develop 100MHz PC SDRAM Component and DIMM specifications. In addition, Intel participates in ongoing industry dialog to assure that memory suppliers get their technical questions answered.

Intel's role is to work with the memory industry to project future requirements, evaluate technology options, to help choose a path with adequate lead-time and then to facilitate communication leading to a complete platform memory solution. This process achieved solid

results beginning in 1994, with the introduction of PDSRAM technology for L2 cache. In 1994-1995, EDO DRAM was supported by the Intel 430FX PCIset to achieve major performance improvements on the Pentium® processor. In 1996, the 430VX PCIset supported 66MHz EDO and SDRAM. Intel's newest chipset, the 440LX AGPset, supports current platform requirements with 66MHz SDRAM. Intel continues to support the memory industry with system level simulation tools and design capability to assure OEMs and users have the right products at the right time.

Next steps:

Intel has delivered the PC SDRAM Component Specification, as well as the Serial Presence Detect and 100MHz DIMM specifications to major vendors and OEMs. These specifications will be available soon on the Intel developer Web site. They provide all the information needed to develop memory modules to support the latest Intel platforms.

The next step in the memory roadmap is Direct RDRAM. Stay tuned to Platform Solutions for future information on Direct RDRAM technology.

For more information:

Revisit this page often for the latest details on the 100MHz PC SDRAM specifications and Intel platform support services. When available, these will include all the information needed to develop and design in memory modules for the latest high-performance Intel architecture platforms.

Be sure to register for the memory track - "[Optimizing Memory Performance](#)" - at the upcoming Intel Developers Forum at <http://www.intel.com/intel/idf>

AGP

What's New:

- First AGP Chipset, the Intel 440LX AGPset, Introduced
(<http://www.intel.com/pressroom/archive/releases/CS082597.HTM>)
- Visit Intel's New AGP Web Site for In-Depth Technical Information
(<http://developer.intel.com/technology/agp/index.htm>)
- AGP Design Guide Now Available
(<http://developer.intel.com/technology/agp/desguide/index.htm>)
- Next AGP Plugfest Scheduled in Taiwan
(<http://www.agpforum.org>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

The Accelerated Graphics Port (AGP) is a new interface on the PC platform that enhances high-performance graphics and full-motion video on mainstream PCs. The AGP interface, positioned between the PC's chipset and graphics controller, enables the graphics controller to use system memory for graphics data (e.g., texture maps) through a dedicated high-speed, low-latency connection. This high performance capability permits the graphics controller to do texture mapping in a single-step process. Prior to AGP, graphics controllers were required to use a two-step process that involved retrieving texture data from system memory via the PCI bus and storing it in special purpose local graphics memory before it could be used. In short, AGP improves graphics performance two ways. First, with a peak transfer rate of 528MB/s, it greatly increases bandwidth of PCI. Second, it helps to alleviate the cost pressures associated with a growing need for local graphics memory by using system memory instead. In addition, AGP lays a scalable foundation for high performance graphics -- future enhancements will bring its peak bandwidth to over 1GB/s. Not only does AGP improve 3D graphics, but its greater bandwidth is a key enabler for full-motion video on the PC. AGP is implemented with a unique connector for graphics accelerator cards, and requires an AGP-compatible graphics card or chip, chipset, BIOS, and motherboard. The AGP specification has been led by Intel and is open to any and all industry players. AGP is a key element in making Intel's Visual Computing Initiative a reality. (See the focus section in this issue of Platform Solutions - <http://developer.intel.com/solutions/focus.htm>).

Benefits To Users:

AGP is delivered via Intel's 440LX AGPset in combination with Intel's Pentium® II processor and its Dual Independent Bus (DIB) architecture. In addition to arcade-quality 3D games, consumers can expect entirely new classes of applications to be enabled by AGP, such as 3D reference works and interactive video titles. Business users will also see new types of applications resulting from AGP, such as 3D data visualization and interactive 3D web applications. AGP will also improve the overall performance of the PC. The DIB architecture of the Pentium II processor allows the CPU and the graphics subsystem to work concurrently, thus greatly speeding up the processing done by both. And importantly, by taking graphics and video traffic off the PCI bus, that bus can be used more efficiently by other devices, such as 100 Mb/s network adapter cards.

Benefits To Manufacturers:

AGP takes PCs to a new level of performance. Exciting arcade-quality games and new classes of applications promise to grow the overall market for PCs, peripherals, and software. By providing a dedicated, high-speed pathway between the graphics controller and system memory that matches the processing power of the Pentium II processor, AGP balances the overall performance of the Intel Architecture PC platform. PC OEMs can build systems that more fully realize the potential of the Pentium II processor, and graphics hardware vendors can build products that are no longer constrained by the limited bandwidth of the PCI bus. AGP is a

scaleable solution so graphics performance will improve in line with performance increases of the Pentium II processor.

Industry Status:

Intel initiated the development of AGP technology and organized the AGP Implementors Forum with industry partners. The AGP-IF is open to all PC industry players and now has over 130 members, including industry leaders in graphics controllers, systems, and software products. As a result of Intel's leadership, AGP technology has matured and many of these companies are now bringing products to market. In the second half of 1997, PC OEM's will begin offering AGP-enabled systems based upon Intel's Pentium II processor and the Intel 440LX AGPset. A number of other vendors have already announced graphics chips and cards that leverage AGP technology for advanced 3D graphics.

In June 1997 Intel organized the first AGP Plugfest to ensure full compatibility of industry designs worldwide. Twelve PC OEMs and 14 IHVs participated in testing, and 134 people attended training. The next AGP Plugfest is scheduled for October 7th and 8th in Taiwan. AGP will also be covered at the first Intel Developer Forum in September. (Please see the Events section of Platform Solutions for more information on the upcoming AGP Plugfest and the Intel Developer Forum - developer.intel.com/solutions/events/industry/).

Beyond the hardware platform, numerous entertainment, educational, and business-oriented software applications that take advantage of AGP are under development by industry software vendors. Microsoft* has also announced support for AGP using DirectX* 5.0, Windows* 98, and Windows* NT 5.0. To speed the availability of AGP-enabled systems and software, Intel has made a virtual device driver immediately available to the industry.

Next Steps:

PC OEMs - To deliver high performance PCs to your customers be sure to choose the Intel Pentium II processor and Intel 440LX AGPset. OEMs should start developing AGP systems now in order to take advantage of the surging momentum behind AGP technology. Be sure to participate in October's AGP plugfest in Taiwan.

Graphics chip and card vendors - Get AGP-compliant products to market in time for the release of AGP PCs at the end of 1997 and beginning of 1998. Be sure to participate in the October AGP plugfest in Taiwan.

Software developers - Now is the time to develop exciting new applications that take advantage of AGP technology. Create apps with rich, lifelike textures to take advantage of the many AGP-enabled PC systems and cards entering the market in late 1997 and early 1998.

For More Information:

Visit Intel's new AGP home page (<http://developer.intel.com/technology/agp/index.htm>) for more detailed information on AGP and a tutorial explaining AGP functionality at the system level.

Visit the AGP Implementors Forum home page (<http://www.agpforum.org>) for more development, product and event information. There you can find the AGP specification and design guides.

DVD

What's New:

- Intel to Bring DVD Movies and Interactive Playback to Mainstream PCs based on the Pentium® II Processor By Year-End
(<http://www.intel.com/pressroom/archive/releases/CN061997.HTM>)
- Intel-Sponsored DVD Test and Compatibility Forum a Success
(<http://www.intel.com/pressroom/archive/releases/DVD80697.HTM>)
- Intel's DVD Authoring Studio in Hillsboro, Ore., provides independent software vendors (ISVs) with access to a state-of-the-art DVD authoring facility.
(http://developer.intel.com/drg/hybrid_author/DEVLAB.HTM)
- DVD now a part of the Open Arcade Architecture
(<http://developer.intel.com/drg/news/coinop/index.htm#toc>)
- Intel Developers Forum to provide a technical training session on implementing Host-Based PC DVD on September 29, 1997.
(<http://www.intel.com/intel/idf>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

DVD, or Digital Versatile Disc, is a new optical storage technology that stores digital information on discs which are similar in size and appearance to CD-ROMs. DVD discs can contain a combination of audio, video, and computer data, and have been designed for use in both the home entertainment and PC environments. By using 50% smaller "pits" to hold data, a DVD disc can currently hold seven times as much information as a conventional CD-ROM. Future DVD discs will be double-sided and double-layered, allowing four times again as much data to be stored (up to 17GB).

DVD technology has been under development for several years and five different variations have arisen to meet the needs of different types of users:

- *DVD-Video* - Read-only storage intended for the playback of entertainment content, such as movies, on consumer DVD players connected to a TV, or on DVD drives in a PC.
- *DVD-ROM* - Read-only storage intended for PCs. Essentially a much larger CD-ROM. Can store video, audio, images, graphics in any format. Ideal for interactive software such as games, reference materials, and other data intensive applications.
- *DVD-R (Recordable)* - Write-once, read-many storage. The target usage model includes archiving, software development, and low volume data distribution.
- *DVD-RAM* - Write many, read many storage. Example applications include short-term archiving, software development, and media recording.
- *DVD-Audio* - This format focuses on music and other forms of audio-only content. A number of technical issues remain to be resolved, including encoding and copy protection.

Consumer electronics companies are currently producing DVD-Video players to be used primarily for playing movies on televisions. In the PC environment, however, DVD will see a broader array of applications, including interactive titles, archiving, and movies. PC DVD drives are also backwards compatible and will play existing CD-ROM titles and CD audio recordings.

DVD-ROM titles for the PC can be encoded in a variety of different formats (e.g., Indeo® video, MPEG1, MPEG2, Cinepak*), whereas DVD-Video titles for home entertainment are generally restricted to MPEG2 video and AC-3 or Linear PCM audio. The range of encoding formats on PC DVD lends itself to flexible solutions which perform decoding in software rather than with dedicated hardware. PCs based on Intel's Pentium II processor are especially well-suited for software playback of DVD content.

Due to the ease with which digital content can be replicated, copy protection has been an important issue in the development of DVD technology. Intel has worked closely with Hollywood studios and the electronics industry to define copy protection solutions that are suitable for both the consumer electronics and PC industry.

Benefits To Users:

DVD promises to offer consumers a new level of visual computing experience on their PCs. Users can come to expect the following benefits from DVD technology:

- *Huge storage capacity* - Today's applications requiring multiple CD-ROMs (e.g., *WingCommander II**) can be consolidated onto a single DVD-ROM disc.
- *Incredible quality* - With DVD, consumers will be able to experience theater-quality video and audio on their PC.
- *Rich interactivity* - The large capacity of DVDs combined with the processing power of the PC will enable software vendors to create applications that provide visually rich, interactive experiences for end-users.
- *Convergence* - DVD video discs will play on both set-top players and PCs.
- *Backward compatibility* - DVD drives can play existing audio CDs and CD-ROMs.

Benefits To Manufacturers:

DVD technology promises to benefit a wide array of industries and companies. PC OEMs will be able to deliver a more interactive and media-rich experience to end-users. Solutions that use dedicated hardware for playback on PCs are already available. Software providers will be able to create new titles that integrate full-motion video, high-quality audio, graphics, and images. In the near term, they can consolidate multi-CD titles onto a single DVD. Drive manufacturers stand to see increased business as the momentum behind DVD builds and sales of PC DVD drives explode. CD drive and disc manufacturers can leverage their existing manufacturing technology to make DVD products.

Industry Status:

All major consumer electronics companies have released or announced DVD-Video players. Moreover, most major Hollywood studios support the medium and have begun releasing movies on DVD. Several hundred titles will be available for the 1997 holiday season. In the PC market, the first DVD-ROM drives for computers began shipping in April of this year. PC OEMs will be integrating DVD drives into their product lines in the latter half of 1997. Initial PCs will rely on hardware solutions for de-scrambling and decoding functions with the move to more cost-effective software-based solutions in 1998. In addition, the software industry is making a concerted move to DVD-ROM with over 100 interactive titles anticipated by the holiday selling season. The DVD-R and DVD-RAM specifications are complete but products are not yet available. Recently, several companies (Sony*, Phillips*, and Hewlett-Packard*) have announced an alternative format to DVD-RAM called DVD-RW. The DVD-Audio specification is still under development and products are not expected until 1999.

Next Steps:

- PC OEMs - Attend the next Intel Developer's Forum for more information on DVD implementations on the PC and upcoming technology directions. A five-hour technical session on DVD will include details from leading Intel architects on the new technology of host-based interactive playback. This track will provide the implementation details to include this new capability on mainstream PCs.
- Software Developers - Start porting multi-CD titles to DVD-ROM. More importantly, begin developing new titles that incorporate full-motion video, high-quality audio, images, and 3D graphics. Visit Intel's DVD Authoring Studio for assistance in with getting your title on DVD.
- Studios - Continue the transition to the DVD format. Expand the collection of titles on DVD.

For More Information:

Understand DVD's role as a key ingredient of the PC'98 Spec just released.
(<http://developer.intel.com/design/PC98/index.htm>)

The DVD FAQ is a good source of more detailed information about DVD.
(<http://www.videodiscovery.com/vdyweb/dvd/dvdfaq.html>)

One stop shopping for DVD information on the Web
(<http://www.unik.no/%7Erobert/hifi/dvd/>)

Intel's DVD Authoring Studio in Hillsboro, Ore., provides independent software vendors with access to a state-of-the-art DVD authoring facility that allows them to do software layout, testing and pre-mastering of DVD content. (http://developer.intel.com/drg/hybrid_author/DEVLAB.HTM)

MPEG Organization DVD Resources (<http://www.mpeg.org/~tristan/MPEG/dvd.html>)

Stay tuned to this Platform Solutions news page for the latest news on DVD on the PC.

Audio

What's New:

- [Intel Announces Audio'98 - Press Release, April 1997](http://www.intel.com/pressroom/archive/releases/CN40797C.HTM)
(<http://www.intel.com/pressroom/archive/releases/CN40797C.HTM>)
- [Audio 98 Roadmap Now Available](http://developer.intel.com/pc-supp/platform/aud98/audio98.htm)
(<http://developer.intel.com/pc-supp/platform/aud98/audio98.htm>)
- [New USB Audio Application Note available for download](http://www.intel.com/design/usb/applnots/292206.htm)
(<http://www.intel.com/design/usb/applnots/292206.htm>)
- [Industry Status](#) (see below)
- [Next Steps](#) (see below)

Technology Description:

Increasing processor performance, integration of functionality and external expansion buses are among the major trends currently transforming PC audio. As processor performance increases, more functionality is accomplished in software. This is an industry-wide trend and can be observed across all platforms and CPUs. Hardware faces competition with software-only implementations and needs to demonstrate a functionality, performance or quality advantage. However, for high performance 3D computing and gaming platforms, hardware acceleration will continue to be desirable. As the attach rate for a function goes up there is more incentive for integration onto the system motherboard or even into the SuperIO or chipset logic. This is also an observable industry trend. External expansion buses offer PC OEMs system design and configuration flexibility, and offer PC customers user-friendly upgrades. The gradual replacement of ISA add-in cards with USB is under way, and IEEE 1394 is also expected to gain momentum within the next couple of years. The transition to external digital audio is expected to be gradual because initial implementations will probably appear first at the mid- to high-end PCs and cost more than highly-integrated motherboard audio solutions. Intel is providing the industry with recommendations and supporting data on hardware vs. software partitioning. Intel is very involved in each of these areas and the Audio '98 roadmap document helps clarify the transitions and what the industry is doing for 1998.

Benefits to Users:

The main benefit to users is that they will get much higher quality audio solutions with several key new features that have not been possible before. 3D positional audio will bring new levels of realism to games with sounds being positioned interactively around the user, making them truly part of the 3D virtual experience. The user will also get much better music reproduction with MIDI utilizing Wavetable synthesis.

Benefits to Manufacturers:

Audio has become a very important and highly visible part of today's PC experience. With the arrival of very high quality built-in audio components and external digital connectivity, the quality of the PC audio experience will rapidly become a function of the PC customer's budget for audio peripherals. The growing diversity of PC audio requirements, platform segments, and buses forces all industry players to acknowledge that there is more than one right way to implement audio. Upcoming OS releases are expected to fully support external digital audio peripherals and emerging digital CE connections, increasing system flexibility and scalability on the high end. By 1998, Intel expects digital extensions to the baseline system audio will emerge based on USB and IEEE 1394 specifications: USB for PC audio peripherals, and IEEE 1394 for connections to digital CE. AC '97 and USB (or IEEE 1394) should be viewed as overlapping yet complementary specifications that provide OEMs with more opportunities to address a wider range of platform implementations. Intel expects that the majority of PCs in 2H98 will support analog connectivity. But in the end, it is the PC OEM who is in the best position to determine whether a SoundBlaster compatible, Digital Ready, or Digital Only audio solution satisfies the customer's needs.

Industry Status:

Intel worked with the industry to develop the AC'97 specification in 1996. Many new audio products are now shipping that support AC'97. PCI (AC'97) audio products will be shipping in volume in the first half of 1998 time frame. With the introduction of Windows* 98 and WDM audio, USB audio devices will be enabled and shipping. The audio quality that AC '97 provides is a key enabler of DVD content, as well as software-driven three dimensional audio technologies such as Intel's recently announced Realistic 3D Sound Experience (RSX) technology. Based on extensive feedback from leading industry audio chip and peripheral vendors, and PC manufacturers, the Audio '98 roadmap highlights the technical ingredients to deliver audiophile-quality audio to the PC.

Next Steps:

OEM's and IHV's: The time has come to start moving away from Legacy ISA audio to new PCI/AC'97 audio for the new features that it will only be able to deliver. All 2H97 products should support PC'97.

E-mail Audio97@intel.com to add your name to the Audio '97 mailing list to receive periodic updates

Come back to the Audio technology Platform Solutions news page for future information on Audio 98.

For More Information:

For more background information (white papers and specifications) go to [Intel's AC'97 web site](http://developer.intel.com/pc-supply/platform/ac97/) <http://developer.intel.com/pc-supply/platform/ac97/>

For more information on the [Audio'98 Roadmap](http://developer.intel.com/pc-supply/platform/aud98/index.htm) go to <http://developer.intel.com/pc-supply/platform/aud98/index.htm>

For more information on USB Audio, download the [USB Audio Application Note](http://www.intel.com/design/usb/aplnots/292206.htm) (<http://www.intel.com/design/usb/aplnots/292206.htm>)

USB

What's New:

- Q&A with Steve Whalley and Bala Cadambi of Intel in this issue of Platform Solutions
(<http://developer.intel.com/solutions/issue/stories/USB.htm>)
- First Wave of USB Products Arriving on the Market
(http://developer.intel.com/design/usb/new_pcs.htm)
- New USB Mobile Design Guide Available for Download
(<http://test.intel.com/design/usb/designex/usbgl10.htm>)
- New USB Audio Application Note Available for Download
(<http://developer.intel.com/design/usb/applnots/292206.htm>)
- USB Compatibility Workshop 10/7/97
(<http://www.usb.org>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

Universal Serial Bus (USB) is the easier to use and flexible interconnect specification that enables instant "outside the box" Plug and Play peripheral connectivity. It allows users to add peripheral devices without expensive add-in cards or configuration headaches such as DIP switches and IRQ settings. A single connector type simplifies connection of all USB-compliant devices, including telephony peripherals, video phones, digital cameras, scanners and monitors in addition to joysticks, keyboards and other I/O peripherals. USB's hot attach/detach capability lets users add and remove devices without turning off their PC. USB also distributes power to peripheral devices and employs a hub architecture that allows as many as 127 different devices to be connected simultaneously.

USB is a key enabling technology for emerging PC initiatives including PC Imaging and Computer Telephony Integration (CTI). Moreover, the connectivity needed to support Intel's Visual Connected PC initiative may now be attained without the need for add-in card solutions.

For more details, visit Intel's USB home page at <http://www.intel.com/design/usb/>

Benefits to Users:

USB expands the PC experience by enabling a new dimension of configuration freedom and interactivity. The absence of add-in cards and power supplies also helps reduce overall system cost. USB is easier to use and allows users to instantly reconfigure their systems "on the fly" by plugging and unplugging devices. Because USB enables both isochronous and asynchronous data transfers, it has the capacity to enrich the user's ability to control peripherals, such as audio speakers, from the PC. The ease of device sharing makes PCs more manageable for users of home and business PCs.

Benefits to Manufacturers:

USB is an open, royalty-free specification which has received broad industry acceptance. USB's ease of use and relatively low cost is expected to support the continued expansion of the PC peripherals market into new and fast-growing areas such as digital imaging, integrated telephony and interactive multi-player games. Absence of add-in cards and, in many cases, external power supplies also simplifies product design and helps reduce costs. Fast time-to-market development solutions are available now from Intel and other suppliers.

Industry Status:

USB technology is in full-swing implementation. Most new PCs introduced in 1997 are shipping with live USB ports, ready to connect to USB-compliant devices. Many USB devices are now arriving on the market, and hundreds of USB peripheral products are slated for release in 1997 and 1998.

Next Steps:

Peripheral Developers - Once they get their hands on USB, PC users may never let go. Now is the time to develop USB-compliant products, so you will be ready to meet this growing level of consumer awareness. The USB Implementers Forum will sponsor one more Developers Conference in Philadelphia September 9 and 10. See the USB-IF home page for more details (www.usb.org).

System Developers - Designing with PCIsets that support USB and the OEM release of Windows* 95 will help position you to meet the anticipated consumer demand for "device-ready" USB-compliant PCs. Plan to attend the USB Developers Conference in Philadelphia September 9 and 10. And be sure to visit Intel's USB home page and the USB Implementers Forum home page for the design information, developer support and product information you need.

For More Information:

See Intel's USB home page for the latest developer resources and design tools
<http://www.intel.com/design/usb/>

Visit the USB Implementers Forum home page for information on development support, products and events. <http://www.usb.org>

1394

What's new:

Presentations given at the 1394 Trade Association Developers Conference held at the Fairmont in San Jose, California in July 1997:

- [Intel presents its commitment to 1394](http://developer.intel.com/solutions/tech/1394.htm)
(<http://developer.intel.com/solutions/tech/1394.htm>)
- [Intel describes its proposal for digital content protection over 1394](http://developer.intel.com/solutions/tech/1394.htm)
(<http://developer.intel.com/solutions/tech/1394.htm>)
- [Industry Status \(see below\)](#)
- [Next Steps \(see below\)](#)

Technology description:

IEEE 1394 is a video-speed serial interconnect that is now an IEEE standard. Like USB, 1394 enables plug-and-play peripheral connectivity, provides power to peripherals helping to eliminate each one having its own power supply, and supports isochronous data transfers. 1394, however, takes these capabilities to video speeds. USB and 1394 serve different needs which will remain and coexist for the foreseeable future. Peripherals that do not require the high data transfer rates possible with 1394 will remain with USB. Eventually, PCs will need only USB and 1394 serial ports to handle all I/O, dramatically simplifying life for PC users.

The consumer electronics industry is already shipping digital camcorders, digital still image cameras, digital satellite receivers, and digital VCRs all with 1394 interfaces. 1394 is the physical bridge that makes the convergence of consumer electronics and personal computers possible. Existing products support 1394 protocols at 100 and 200 Mbps, with 400 Mbps products shipping in 1998. The 1394 road map extends to speeds at 800, 1600, and 3200 Mbps.

1394 also provides the storage industry with a PC interconnect to follow on IDE and the printer industry to replace the parallel port. Because 1394 can handle very high data rates, it encourages peripherals to transmit more "raw" data to the PC for host-based processing, which can significantly reduce the cost of some peripherals like digital still cameras. 1394 is important not only for connectivity to new digital consumer electronics devices, but also for core PC peripherals as they move to higher data rates.

In conjunction with USB, 1394 makes possible new "modular" approaches to PC architecture with the modules tied together with two serial buses. The proposed Device Bay specification (<http://www.device-bay.org/>) is an excellent example of the great new applications enabled by 1394 (and USB), in this case providing peripheral modularity.

Benefits to Users:

One promise of 1394 is a significantly enriched PC user experience. Users will be able to use their PCs to control consumer electronics and PC peripherals, edit audio/video content, link peripherals to the internet, and much more. 1394 will bring the PC to the family room to provide entertainment, gaming, and learning experiences not possible today.

Modular PCs will allow users to buy as little or as much PC as they like and to upgrade their PCs selectively, at will and painlessly. A personal computer system becomes more like a component stereo system, with 1394 playing the role of a digital RCA connector.

Benefits to Manufacturers:

Because it is plug and play, 1394 confers all the same benefits as USB to manufacturers in terms of ease-of-use and reduced customer support requirements. The user never needs to open the box. Because 1394 enables users ready access to rich digital content, it will make the PC more attractive, thereby driving revenues. The modularity offered by 1394 (in conjunction

with USB) offers PC manufacturers a greatly simplified manufacturing process and lower inventories in both the factory and in the field. Peripheral manufacturers benefit from compliance to a single industry standard supported by both the consumer electronics and computer industries, allowing in many cases the same SKU to be sold into both markets.

Industry Status:

IEEE 1394.1995 is in production today in consumer electronics equipment. An enhancement, called 1394.A, is expected to go to the IEEE for balloting in 1997. The industry is actively working on closing the definition of 1394.B, which will define 1394 at speeds of 800 Mbps and beyond. Intel expects some 1394-enabled PCs to be available by the end of 1997 and processor chipsets supporting the 1394 Open Host Controller Interface to be available in 1998.

The transfer of copy protected video is a very hot topic and important to the movie industry. Intel has proposed a digital content protection method to the 1394 Trade Association that is available now for review.

Next Steps:

PC systems vendors and peripheral manufacturers: make plans now to support 1394 ports on your future systems if you haven't already. Everyone, including consumer electronics manufacturers: insure your 1394 interfaces are defined in compliance with the IEEE specifications and 1394 Trade Association guidelines to ensure interoperability.

For More Information:

Contact the [1394 Trade Association site](http://www.1394ta.org) for more information on 1394 and links to many other 1394-related sites. (<http://www.1394ta.org>)

Power Management

What's New:

- [Power Management Specifications for the Instantly Available PC](http://developer.intel.com/ial/powermgm/specs.htm)
(<http://developer.intel.com/ial/powermgm/specs.htm>)
- [PCI-Power Management Specification Available for Download](http://www.pcisig.com/pm10.pdf)
(<http://www.pcisig.com/pm10.pdf>)
- [Industry Status](#) (see below)
- [Next Steps](#) (see below)

Technology Description:

The Instantly Available power managed PC is a new way of viewing power management requirements for today's fully featured home or office PC. The goal of the Instantly Available PC is to have a high performance, feature rich PC that is power efficient when active and idle, always connected even when "off", and "instantly available" to users whenever needed. The Instantly Available PC is made up of several industry standard ingredients:

- ACPI (Advance Configuration and Power Interface) provides a standard yet flexible interface between hardware and applications to communicate their power management capabilities to the operating system.
- PCI-PM (PCI Power Management) allows add-in cards to participate in the overall power management scheme and introduce a new methodology to the scheme as well.
- A Dual Mode Power Supply will provide clean and intelligent power delivery under both heavy and light loads.
- An ACPI enabled OS will combine the above ingredients to create an intelligent power management platform.

Benefits To Users:

Because of the Instantly Available PC, home users will experience a PC that behaves much like a consumer electronics device. When it is not active, it appears to be off - there is no noise, no heat and very low power consumption. With the ability to be connected to external consumer electronic devices via USB (<http://developer.intel.com/solutions/tech/usb.htm>) and 1394 (<http://developer.intel.com/solutions/tech/usb.htm>) ports, the Instantly Available PC will be the hub of the entertainment center. For example, when you insert your DVD movie, your PC would wake itself up and send the decoded video and audio signals to your ACPI compliant TV and amplifiers after it woke them up too. The Instantly Available PC will deliver a whole new level of usability and robustness, giving us new capabilities for the PC platform touching multiple aspects of everyday life.

For the office PC, the Instantly Available PC has additional benefits with the ability to resume on a LAN event. Intel's Wired for Management initiative (<http://developer.intel.com/solutions/tech/wfm.htm>) specifies remote wake up policies and procedures to help IT lower the TCO (Total Cost of Ownership). These can be implemented with the Instantly Available PC. No longer will IT managers have to worry about a PC being turned off and unable to get a software update packet. Energy savings because of power management are apparent, but your cooling cost throughout the entire campus will be lowered too.

Benefits To Manufacturers:

The Instantly Available PC combines an industry set of standard power management specifications that peripheral vendors and PC OEMs can develop products around. This ensures that all products will correctly work with each other and will be able to fully take advantage of the system power management scheme. By adhering to industry established standards for power

management, PC OEMs and peripheral vendors will not have to bear any additional R&D cost associated with developing an Instantly Available system or peripherals. By broadening the PC platform's capabilities we open the door up for different products that we can connect to the PC and enhance the users' experience.

Industry Status:

Intel, Toshiba*, Microsoft* and many other PC manufacturers are working on bringing ACPI platforms and peripherals to the PC community by the end of 1997. Microsoft has announced that its next version of Windows 95* and Windows NT* will be fully ACPI compatible. Most PC and peripheral manufacturers should provide full ACPI implementations by the third quarter of 1998. PCI-PM is now available from the PCI industry special interest group.

Next Steps:

Peripheral Developers and OEMs become familiar with the key ingredients for the Instantly Available PC. Download and understand the specifications for each. Available now for download at (<http://www.teleport.com/~acpi>) is the specification for ACPI, and the PCI-PM specification is available at (<http://www.pcisig.com/pm10.pdf>). To learn more technical details about the Instantly Available PC, attend the Intel Developers Forum on September 29th (<http://developer.intel.com/intel/idf/>).

For More Information:

For a closer look at ACPI
<http://www.teleport.com/~acpi>

Power Management Specifications for the Instantly Available PC
<http://developer.intel.com/ial/powermgm/specs.htm>

Understand the History of Intelligent Power Management
<http://www.intel.com/mobile/tecforum/history.htm>

PC 98

What's New:

- PC 98 System Design Guide 1.0, co-authored by Intel Corporation and Microsoft Corporation Release to the Industry
(May be viewed on-line at <http://developer.intel.com/design/pc98/index.htm> or <http://microsoft.com/hwdev/pc98.htm>)
- Leading the Way to PC 98; Read an overview of PC 98 and Intel's role by Jim Pappas, Director of Platform Initiatives at Intel
(<http://developer.intel.com/solutions/issue/stories/pc98.htm>)
- Industry Status (see below)
- Next Steps (see below)

Technology Description:

The PC 98 System Design Guide describes and recommends how a range of PC platforms should be designed to enhance user experience and satisfaction. PC 98 covers mobile PCs, business and consumer PCs, entertainment PCs and workstations that will ship from mid 1998 through 1999. Hand-held devices running Windows CE and servers are not included in the PC 98 document.

The Design Guide is divided into four parts: Part 1 covers upcoming technologies that will be available in the 1998 and 1999 timeframes. Part 2 contains a rigorous description of System Types - most of this section describes a Basic PC 98 from which a Business, Consumer or SOHO (Small Office Home Office) desktop can be derived; two styles of Entertainment PCs, a two-foot viewing experience and a 10-foot viewing experience are described. Mobile design considerations are covered in a separate chapter, as are workstation design issues. Part 3 describes expansion bus options such as USB, IEEE 1394, PCI, SCSI and other industry specifications. Part 4 details how add-in and add-on devices should be designed; many new technologies and specifications are introduced in this section.

Benefits to Users:

PC 98 describes the introduction of new technologies into PC designs that are becoming more tailored for specific uses in the business and consumer markets. These new technologies and platform designs are intended to increase the utility and ease of use of the PC for different kinds of tasks and offer more choices to businesses and consumers. The overall goal of PC 98 is to address the expanding uses and users of PC technology and to enhance the user experience and satisfaction.

By writing this document together, Intel and Microsoft are ensuring that the enabling hardware and supporting software will be available at the same time. The lead time for new hardware designs and for software device drivers is being overlapped to shorten the time to a working, available solution. This up-front cooperation and planning will result in a better user experience.

Benefits to Manufacturers:

Introducing multiple new technologies into the existing PC platform infrastructure could create numerous problems. By working together and with industry experts, Intel and Microsoft have identified a variety of solutions and are creating new industry specifications, or supporting existing industry specifications, to ease rapid and successful absorption of these new technologies. By driving open specifications, Intel can also encourage innovation throughout the multiple PC platform design choices.

Industry Status:

Intel has worked with Microsoft on previous versions of the PC 9x design guide. Intel also had many projects on-going to introduce new hardware technologies and increase ease of use and satisfaction of PC hardware to the end user. It was only fitting that Intel work with Microsoft on

PC 98. Intel and Microsoft have both worked with the industry since February 1997 to review and improve the PC 98 System Design Guide.

Version 1.0 of the PC 98 System Design Guide is now available for review and download from Intel's and Microsoft's web sites.

Next Steps:

If you are currently designing PCs or peripherals for shipment after June 1998 and throughout 1999, the PC 98 System Design Guide is an "must-have" reference. It contains definitive information on the evolution of the PC platform, together with essential information for developers. Visit Intel's developer site for your copy!

For More Information:

Intel's developer web site also contains detailed design information on all aspects of PC design.
<http://developer.intel.com>

See the other Platform Solutions pages (Platforms and Technologies) for the latest news and information on PC technologies found in PC 98.

Industry Events:

I2O Compliance Workshop

September 16 - 19 in Nashua, New Hampshire -

This is the I2O SIG's 4th Compliance Workshop. The event features a plugfest among IHVs and ISVs involved in developing I2O-ready products. Information on schedule and logistics are available on the Members-Only section of the I2O website.

Please visit <http://www.i2osig.org/>

WfM Baseline & Network PC Interoperability Test

September 22 - 26, Tigard, Oregon -

Working engineering sessions for Managed PC OEMs, workgroup and enterprise management solution providers. Readiness of Managed PC building blocks for the personal computing industry will be demonstrated. Test suites and expertise for vendors to test platform readiness with Network PC (Net PC) and WfM guidelines as well as workgroup and enterprise management solutions will be provided.

For more information contact Marc The'berge, Intel Corp., at 503-696-6149

Intel Developer Forum

September 29 - October 1, San Francisco, CA -

Introducing the Intel Developer Forum - the industry's best source of tools and training for advanced hardware developers - will feature three days of in-depth technical sessions and demos presented by Intel's lead architects, on the latest Intel technologies and initiatives. Intel Founder Gordon Moore and other Intel executives are presenting technical keynotes.

Choose from ten technical tracks: Wired for Management, Host-Based Interactive DVD, Optimizing CPU Performance, Optimizing Memory Performance, Power Managing the Desktop PC, Designing PC Theater Products, Desktop I/O and Graphics Technologies, Mobile Platform Design Techniques, Server Platform Design Techniques, and PC 98 - Beyond the Design Guide. Please visit the Intel Developer Forum web site for agenda and registration information:

<http://www.intel.com/intel/idf/index.htm>

USB Compliance Workshop

October 6-9, So. San Francisco, CA -

USB industry plugfest. OEMs and IHVs will be on hand to test for compatibility and interoperability of their USB products. For registration information, visit the USB web page at <http://www.teleport.com/~usb/calendar.htm#cwoct>

AGP Plugfest

October 7 - 8, Taipei, Taiwan -

Intel led industry forum which will give regional Independent Hardware Vendors (IHVs) an opportunity to test the interoperability of their AGP-enabled products with PC OEM platforms using the Intel 440LX AGPset. Now's the time to test your products to be ready for the AGP wave coming in early 1998.

For registration information please visit the AGP implementors forum at <http://www.agpforum.org>

Intel at NetWorld + InterOp

October 8-10, Atlanta, GA -

Intel will demonstrate a full range of networking products at this key industry networking show. Intel managers will also participate on the wireless and mobile PC discussion panel.

For more information please go to http://www.interop.com/events/ni_atlanta97/home/index.html

Intel at Power '97

October 12 - 15, Santa Clara, CA -

Fifth international conference on power requirements for mobile computing and wireless communications. Steve Nachtsheim, Intel's Vice President and General Manager of Mobile and Handheld Products Group, will provide the opening keynote.

Contact: Mara Friedman at 617-792-2612 for more information or go to

<http://www.gigaweb.com/events/>

Intel at Fall Comdex

November 17-20, Las Vegas, NV -

Intel will be exhibiting on the main show floor and demonstrating the latest Pentium® II processor platform and technology ingredients for the home and small/large business environments. Intel speakers will participate in various panels and sessions. Also, don't miss the Intel BunnyPeople(TM) performing live at the main show floor.

For more information visit the Comdex web site at <http://www.comdex.com>

Intel at Internet World

December 8-12, 1997, New York, NY -

Intel will demonstrate all of the areas supporting the growing Internet application area, from client desktop and servers using Pentium II processors, to software applications to networking solutions.

Intel speakers will participate in panels and discussions on the Internet, E-commerce, and telephony.

For more information visit <http://events.internet.com/fall97.html>

Intel Networking Events & Training

For Intel's events and training programs on Networking products and technologies, please visit the Intel networking events page at: <http://www.intel.com/network/events/index.htm>

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